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REPORT

OF THE

SIXTH ANNUAL MEETING

OF THE

ASSOCIATION OF

EXECUTIVE HEALTH OFFICERS

OF ONTARIO

HELD AT

GUELPH, JUNE 27TH AND 28TH, 1893.

ALSO

INDEX CONTAINING LISTS OF OFFICERS

AND

CONTENTS OF ANNUAL PROCEEDINGS,

From 1887 to 1892.

TORONTO:
Printed by Warwick Bro's & Rutter, 68 and 70 Front St. West.
1894.

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REPORT

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EIGHTH ANNUAL MEETING

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REPORT

OF THE

EIGHTH ANNUAL MEETING

OF THE

ASSOCIATION OF EXECUTIVE HEALTH OFFICERS OF ONTARIO.

The Eighth Annual Meeting of the Association was held at Guelph, Ontario, on June 27th and 28th, 1893, in the Council Chamber of the City Hall, which had been kindly placed at the disposal of the Association, by the Mayor and Council. The Mayor, Council, and Local Board of Health, acting for the citizens, gave the Association a most enjoyable time, and one which will long be remembered.

FIRST SESSION—TUESDAY MORNING.

The Association met at 11 a.m., the Mayor, W. G. Smith, in the chair. The meeting was opened by prayer by the Rev. Mr. Ross, in place of the Ven. Archdeacon Dixon, who was unavoidably absent.

Mayor Smith, on taking the chair, expressed pleasure that the Council of the Association had decided to hold their Annual Meeting in the Royal City of Guelph, and that so many physicians and sanitarians from different parts of the Province, were present.

Dr. H. Howitt, Medical Health Officer, in his address of welcome from the Local Board of Health, said :

Members of the Association of Executive Health Officers of Ontario,—It

o greet you, and extend to you, in

a hearty greeting to the Royal

We recognize in the chief object, which the members of your Association have in view, a high and noble motive—improvement of the public health. The accomplishment of this end necessarily implies fewer premature breaks in our family circles, less suffering to those who are near and dear to us, and not so much cause for sorrow and worry in our midst. It also portends a decrease in the population of our hospitals, poor-houses and jails, a higher physical and mental standard of the people generally, and ultimately immense saving of public and private funds.

Educating the public, in matters relating to the cause and prevention of disease, is of incalculable importance. Already, although the movement is in its infancy, it has enabled the authorities of rural municipalities, towns and cities, and the governments of countries to adopt measures which have either prevented epidemics, or proved successful in arresting the progress of diseases, that formerly carried off hundreds, thousands, and ten of thousands.

Owing to the duration of your annual meeting having been curtailed by one day, and the large number of papers, besides other matters connected with organization, appearing in the programme for this morning's session, your secretary has warned me to make my remarks as brief as possible.

In conclusion, allow me to state that we are aware many of you have come here at considerable personal inconvenience and expense, and we therefore sincerely hope that the efforts our authorities and citizens have made to entertain you, during your brief stay may prove pleasing and acceptable to you.

Mayor Smith then introduced Mr. Robert Melvin, Chairman of the Local Board of Health, who said:

Mr. Chairman and Gentlemen of the Association,—Dr. Howitt, in his address, has fully expressed the opinion of this Board. We are exceedingly glad to welcome the Association to our city, and trust that not only the city but the Association will be helped by the discussions to take place. I hope the influence you gentlemen will bring, will aid us greatly in the future. I am glad to meet you, and I am sure we are all glad to have you here, and trust this meeting may be profitable to us all. As most of those present have come from a distance to take part in, and listen to the discussions, it will be ill-befitting in me to take up your time. I only hope the results of this meeting will be good, and that I shall have the pleasure of meeting you all at the Hospital this afternoon.

Mr. W. CHIPMAN, C.E., Brockville, President of the Association, replied to the addresses of welcome, and called upon Dr. Coventry and Dr. Macdonald to assist him in the same.

Mr. CHIPMAN : On behalf of the Association, I thank you for the addresses of welcome extended to us, and hope the discussions will be profitable to all. I think it would be better o make the papers as short as possible, and spei d more time on the discussions.

Dr. J. W. COVENTRY, Medical Health Officer, Windsor, replying to the addresses of welcome, said :

I, for one, am delighted at being present. I never had the opportunity of seeing your city before. So far as I have seen it, it looks as clean as it is pretty. The words of welcome are such as to please us all, and as our aim is to aid those we visit, I trust we may be of service to you.

Dr. J. D. MACDONALD, Hamilton, member of the Provincial Board of Health, said :

You have heard my first notice to respond to the welcome offered by the City of Guelph to this Association. I am glad of the opportunity of seeing you, and have to thank you for the kindly way you have spoken of the Association. The study of hygiene, and kindred subjects, has different influences upon a community ; there are the moral effects as well as the hygienic. We should observe the laws of nature in all things we know and should follow them. We get nothing for nothing. Amongst other things, with regard to the observance of these laws, is the necessity for self-control and self-denial, and one of the things health officers have to deal with is to take into consideration that they are acting as guides to the public, and though the people may think it too much trouble to undertake sanitary work, when they are once shown the necessity for the same through outbreaks of disease, etc., they will thank the health officers heartily for all their work and guidance. On the part of this Association I desire to express the gratitude we feel, for your kind reception.

Mayor SMITH : I am sure all present are pleased with the responses to the addresses of welcome.

Dr. BRYCE, Secretary of the Association, said :

Before proceeding with the meeting I would say, that in the Annual Report of the last year's meeting the members have had an opportunity of reading the minutes of the Niagara meeting, and will have had the opportunity of approving or correcting anything in them. I will simply refer you to the business mentioned in these minutes.

Dr. Bryce then read the minutes, after which the following motion was carried :

Moved by Dr. Bryce, seconded by Dr. Macdonald, "That the minutes of the Seventh Annual Meeting of this Association, held at Niagara Falls, as now read, be adopted."

Dr. Howitt then said : I suggested to the Secretary at the meeting of the Executive, that at our meeting we, if possible, should spend as much time as possible on the discussions of the papers, and if the members who are present, and who are to read papers, will leave out such parts as can be conveniently omitted, it will help the Association to get through the programme by the time stated on the programme, and it will be more profitable to take part in the discussions, than listening to lengthy papers.

Dr. Bryce read a letter from Professor Mills, of the Ontario Agricultural College, regretting his inability to be present at any of the sessions, or to read his paper.

Dr. Chas. A. Hodgetts, Toronto, then read a paper on "Diphtheria Epidemics and how Principally Propagated."

Discussion on the paper followed.

Dr. Macdonald : I am always impressed with the conviction that we have a great deal to learn. We can all tell that a person has been exposed to infection, but the question remains whence comes the bacillus, as like many other forms of life found on the earth.

A family takes into its head to improve its system of disposing of sewage, and a little room at the head of the stairs is turned into a water-closet, and no means of ventilating the air of that room added. A member of that family is attacked with diphtheria, while no other members of the same family are affected with it. How was it, that if the diphtheria was caused by the closet, that no other members of the family were affected ?

A man builds a house. The house is of wonderful size, and particular pains are taken to cut off one half of it, having the children's rooms, and having one of these institutions, a closet, as I have suggested. The children, or some of them, are attacked with diphtheria ; we hear that sewer gas is the cause. The bacillus must have reached there either by the sewage or by the gas. It is a question whether these institutions I speak of, are the great aids supposed.

On certain occasions, with infected individuals, cases of the disease have been known to be got from others. How, I cannot tell. But it was probably more from infection of persons who had the cases, than from the closets. But this is a difficult subject, and if any one has any further knowledge on the subject, he should make it known. If we knew more about it, we might not suffer so much from it.

Dr. SHEARD, Toronto : From the spread of the contagion, I think we may draw the conclusion, that the bacillus is the cause. What has led to the development remains to be found. Contamination through the schools is a fact, and I think a great many practitioners do not know how to deal with diphtheria, or recognize when proper isolation has been carried out. About forty-eight hours only have passed in some instances, when certificates have been given allowing children in infected families to attend school. The physicians strive to please their patients and families rather than the law. If the health officer were allowed the permission to give the certificate to allow the child to return to school, much mischief might be prevented. From illustrations given in the London *Lancet* it was found that the bacillus left upon threads placed in tubes at a temperature favorable to their development, and when the threads were taken out several months after, the bacilli were found to grow in cultures. Another instance is shown by the fact that a case of diphtheria occurred in a room, and eighteen months afterward, after paper was taken off and the walls rubbed down, cases again occurred in the same room. I think this justified the opinion that the germ possesses the power of disseminating disease several months afterwards. We all know that diphtheria increases till June, and how it fails when the schools are closed, and begins again when the schools re-open. The Kindergarten system is dangerous, and aids the propagation and dissemination of this disease.

Dr. H. ROBERTS, New Germany : I may say we have had some diphtheria. Diphtheria may be caused by wells. The schools have been protected against contamination by washing with bi-chloride solution, the closets cleaned and water examined. The cause might have been allowing the children to return to the school before the infection had entirely disappeared, or the cases may not have been properly diagnosed. If the bacillus is present, a little of the membrane seems to develop malignant diphtheria. If there were the first symptom in any other member of a family, I would say he had diphtheria or croup.

Dr. N. WALKER : I think the physicians ought to draw the attention of the lay brethren to the fact, that there is danger in attending funerals in cases of diphtheria, and that funerals should be absolutely private, and that no delay be made in having the same take place.

Moved by Dr. Bryce, seconded by Dr. Coventry, "That the gentlemen present not members of the Association be invited to take part in the discussion." Carried.

Dr. McKINNON, Guelph : During fifteen years we have not been without diphtheria. In the early years it was the diphtheritic croup, now the immediate cause of death, at least in these last few years, has been due to asthenia from the poison in the system. Nearly every case, whether adults or children, recovered so far as larynx was concerned. In the past year, we have not had a case of diphtheria, that we know of. That many cases occurred, which resembled diphtheria, but which ought not to have been so considered, is perhaps inevitable when the disease is prevalent. It was very prevalent till the middle of last year. I think I may give credit to the physicians of Guelph, for aiding greatly in stamping out this disease, aided also by the help given at the hospital. In July and August of last year it was very prevalent, then to the end of the year, notwithstanding every effort made to grapple it. With such rapid transit as we have now it is difficult to locate the cause of infection.

Dr. CAMERON : I should like to know what Dr. Sheard meant by the the statement that medical men did not know how to deal with diphtheria.

Dr. SHEARD : I mean that doctors are not fully alive to the danger of dissemination of the disease ; to the magnitude and responsibility of the disease.

The discussion on diphtheria was then brought to a close.

Moved by Dr. Howitt, seconded by Dr. Macdonald, "That Dr. A. Groves, of Fergus, be requested to read his paper on 'Notes on the Prevention of Disease,' at the evening session, in place of Professor Mills, from whom a letter has just been received stating he will be unable to attend." Carried.

Robert Barber, Toronto, Provincial Inspector of Factories of Ontario, read his paper on "Sanitary Condition of Factories in Ontario."

Dr. Bryce, Secretary, then read various sections of the constitution bearing upon the status of members, fees and election of officers.

The Association adjourned at 1 p.m.

SECOND SESSION—TUESDAY AFTERNOON.

The Second Session was opened by prayer by the Rev. J. C. Smith.

The discussion on Mr. Barber's paper, on "Sanitary Conditions of Factories in Ontario," was proceeded with.

Dr. GRIFFIN : I was thinking, while Mr. Barber was reading his paper this morning, that he gave a lot of valuable suggestions, and I have no doubt all present will receive these views. I would like to speak of one or two points.

Regarding the ventilation of large factories, that known as the hot blast in operation in the Massey manufactories and others, is not practicable for schools, as proved in Brantford, where steam heating and ventilating, as at present in the county gaol, is found defective. In large workshops it is very practicable. A large fan worked by the engine forces a blast of warm air into the shops, and afterward this is forced out. This form of heating and ventilating is very satisfactory, and seems well adapted to the purposes for wh ch it is applied. There are a number of points in the occupation of the rooms, as that in laundries and tailor shops, that Mr. Barber has touched on. In these it is exceedingly necessary to obtain free ventilation. Then there is the question of latrines. Great difficulty is experienced in managing the closets used by the employees, as they do not take any special care to keep them clean, or well attended. We have in the market-place, Brantford, a public latrine so arranged as to prevent freezing and have obviated the very disagreeable and objectionable points which, hitherto have had to be dealt with, in large factories. I regret it will be impossible to enter into the details by which this has been accomplished, but any time any one wants any latrines constructed I shall be glad to assist him in adopting one. In some large cities you will find very successful ventilation where there is heating, but we have succeeded in obtaining this without heating, and anyone writing to Brantford, will be provided with details. In the large factories in Brantford the closets in different respects have been improved. We shall be glad to show you the improvements we have made in this matter.

Dr. COVENTRY, Windsor : I have found by far the greatest contamination of the workroom, is caused by the use of charcoal. The large factories are under the Inspector's eyes continually, but in the small shops, such as tailor shops, etc., I have noticed fumes of charcoal. There is a

large number of these all over the country, and I would especially draw the attention of the Inspector to this point. Regarding the injuries from dust, I think it is a practical point to which attention should be drawn. The ordinary school-house has its floors built of pine and is always full of dust, which is always rising. I recommend that, in rural districts, it be made compulsory to have the floors made of hardwood, such as soft maple. I take this opportunity of drawing the attention of all those engaged in sanitary work, where they can, to have school floors of hardwood. This would hold good in large factories.

Mr. CHIPMAN, Toronto: Having had the opportunity of seeing the latrines spoken of by Dr. Griffin, I might say a few words on the matter. There is a great difficulty in all towns in which I have to do with sewerage works, to have the latrines and closets satisfactory, not only to the owners but satisfactory from the sanitary standpoint. The latrine in Brantford is new, and one which I have not seen the like of, anywhere else. I would recommend it for any public building, and especially for railway stations. These are very foul in most instances.

Dr. E. E. Kitchen, St George, next read a paper on "The Inspection of Cheese Factories."

Dr. MCNAUGHTON, Erin, in discussing the paper, said: We feel gratified for the remarks made by Dr. Kitchen. One question I should like to ask with regard to tuberculosis is, is tuberculosis in animals the same as tuberculosis in the human race? It would seem unwise for us to say tuberculin is of no use, as it may prove as great a value to the human race as to the bovine. I do not think milk from animals with tuberculosis in the early stage should be pronounced unsafe.

Dr. GRIFFIN: I think there is considerable force in the observations made by Dr. McNaughton. Perhaps we have been carried away by Prof. Koch's experiment. Regarding the experiment of tuberculin in cows, it is one in which there is a great deal of promise, and I trust it will be of great assistance. Regarding the necessity of destroying tuberculous cows when the disease is inactive, have we arrived at the stage when we know when to interfere? We all know that a great deal of milk we use is infected with tuberculosis. While a great many cases of tuberculosis exist still the milk may be good. Speaking about the value of milk, regarding the percentage of cream, and the illustration made by the author of the paper, that milk should be judged by its butter fat, I do not know the experience in Guelph, in Hamilton or in Toronto, but I am free to say that if they are not seeing frequently and continually to the inspec-

tion of milk they are neglecting a great duty which ought to be done. Some five or six years ago the milk examined at the hospital at Brantford was found to be 2.10 to 2.15 per cent. of butter fat, the poorest milk in the city, and which was obtained by tenders for the lowest price. By doing this they received the poorest milk. The by-products of starch cause 25 to 50 per cent. loss in butter fat. To the use of this milk was attributed a great deal of sickness, diarrhœa, etc. So far as the question of the production of cheese is concerned I have no experience, and therefore, have nothing to say regarding it.

Dr. BRYCE, Toronto: My experience as executive officer of the Provincial Board of Health has brought to my attention the fact, that the subject discussed by Dr. Kitchen is one of more than usual interest and importance. There have been cases where almost whole herds were infected with tuberculosis, in the country. Another difficulty of dealing with rural municipalities is that of keeping pigs in connection with cheese factories. It does not seem to have been impressed upon the owners that the smells from the pig-pens do directly injure cheese, and that the lactic acid that causes good milk to be injured is more rapidly developed in filthy surroundings. Often cans of milk sent to the city are quite unfit for use. It does seem desirable that this Association should, as far as possible, give information on the subject to our cheese associations Of course these gentlemen are men of influence and no doubt can do much to impress these matters upon the farmers. But there is another side which has been brought before our Board. Two years ago I was sent for to inspect a piggery near a cheese factory. One would have thought the company would have known that it would have an influence upon the cheese, but I had difficulty in pointing this out and had to use the arguments contained in the Public Health Act, when one would have thought that mere commercial interests would have been enough to cause the managers to see the point, and it was with difficulty a great nuisance was removed. That one of the great dangers is the transmission of tuberculosis to children and invalids, I do not think any of us can be thought of as cranks if we assert this. If there is one subject on which one would be inclined to be a crank it would be upon tuberculosis. I have been studying the back figures of those dying in families in some of the older counties, as Welland, Lincoln and Prince Edward. I have learned that during the past ten years there have been there 1000 names of persons who have died from tuberculosis, and the average number of deaths having the same name, have amounted to the average of nearly three deaths per family.

If that is true in families we would say that it is due to infection or hereditary tendency, but what we do know is that having got it on the premises once it has gone on until the family is disseminated. If that is true with regard to human beings, we can hardly be called cranks for thinking it to be the cause of tuberculosis in animals. We often notice the death of members of two families in one year. I would say that here infection would be the direct cause, and in one or two cases you find that one or two cases in the same year seem to mark the starting point in that family. Where did the starting point begin? In Welland, Lincoln and Prince Edward it must have been introduced on the premises, just as diphtheria was introduced into Renfrew. What caused it? We have found in foreign statistics that a high percentage of cattle are affected with tuberculosis. But what it is in Canadian cattle we do not know. There is a tendency to the spread of the disease from the exhalations of the cow's nose and the saliva from the mouth, thereby infecting the stable, and if one cow licks the cow next her, the latter is going to be soon infected. We have found the infection in Government and other stables. The reason we cannot eradicate it is because the people do not realize that it is infectious, and until it is realized we will not get rid of the disease. While I agree with Dr. Griffin that, so far as our knowledge goes, we may have an infected animal which may not be liable to convey the disease to other cattle, yet this can only be in the early stages of the disease. We have now tuberculin, the material which was proved not to be the cure of cases of tuberculosis, but it placed beyond doubt, the fact that we find that the person who had tuberculosis had a rise in temperature after injection took place. The same tests have been applied to cows, and most interesting results of practical value to us have been the outcome. It has been shown that we will get febrile reaction in twelve hours in tuberculous animals, and the question is now, not regarding the diagnosis, but will the diagnosis in a cow of tuberculosis in any case allow us to say we have not real danger present. Enough of tests perhaps have not been made, but as far as our own tests go, we have been able to show, on *post mortem* evidence, the presence of the disease. I do not think any member here will say that a cow infected with tuberculosis is a healthy animal, and I trust that this Association will not sanction any view which might lead to this conclusion.

Dr. MACDONALD, Hamilton: Regarding the keeping of pigs in connection with cheese factories, I would recommend the method of having them placed in a field with a portion fenced off, and when the ground of that

portion of the field became unsanitary, to plow the ground under and remove the pen to another part. This would not be much trouble. There is no reason why we should not have better cheese, and without nuisances. Referring to the case of the nuisance in Hamilton as well as other places, we need a few Provincial Inspectors, who can look after these interests. They should be supported by strong powers. I would draw the attention of the Association to the necessity of appointing such Provincial Inspectors.

Mr. McCrae, Guelph : It is said Toronto is behind on the milk supply question. I wish to say that as a country in milk supply we are in many ways advanced. Denmark leads in the question. It has the best and purest milk in the world. The system there is of joint stock companies. The cans are all inspected weekly. The families of all those people who keep these cans, are inspected weekly. Should disease break out they pay the attendance of the medical man appointed. Why should we not have as good a system of supply in Canada? It would pay, not only financially, but from a sanitary standpoint. Regarding the amount of five per cent. of tuberculosis existing in Canada, in England twenty to thirty per cent. of the cattle are infected. In the practice of one veterinarian, there were two hundred cases. Dr. Bryce says we may account for the prevalence in some degree to infection through milk. Dr. Bryce has said we allow cattle to mingle together, and yet we do not seem to see that several people living in the same house may be affected, and who in the last stages of tubercu'osis are mingling with the general public It seems to me that, now with knowledge, there should be more care in this direction. It has been suggested, that all cattle in the country be inspected by the tuberculin test.

Dr. Bryce, replying, explained regarding tuberculin and the bacillus of tuberculosis.

Mr. McCrae continued : A great many men have stated they would not have their cattle injected with tuberculin.

Dr. Bryce, replying again, said : I think the danger to man from infection, when in the human race, is greater even than when in the bovine.

Dr. Walker, Toronto : I wish to refer to a particular case. A calf a few weeks old, supposed to be suffering with tuberculosis, was killed. The *post mortem* showed the abdominal organs were one mass of tubercles. We therefore, felt justified in thinking that tuberculosis must have been ransmitted by the cow to the calf at its birth.

Dr. McCrae, Guelph, then read his paper on "Sanitary Needs of the Farm," which was followed by a paper on "Pure Water on the Farm," by F. T. Shutt, F.C.S., Chemist of the Experimental Farm, Ottawa. After reading his paper, Mr. Shutt stated that about seventy per cent. of all well water is contaminated. That the Dominion Government charges nothing for analyzing water if the person sending it, pays the express charges.

Dr. Cassidy, Toronto, next read a paper on "Toronto Water Supply."

The Association thereafter adjourned at 4 30 p.m., and the members were driven to the General Hospital, which they inspected, and where they were hospitably entertained by the trustees, refreshments being served by the matron and nurses. Afterward the members inspected the waterworks.

THIRD SESSION—TUESDAY EVENING.

At 7.30 p.m. the Association assembled at the Skating Rink to witness the performance given by Captain Clarke for the entertainment of the Association. It consisted of military manual drill, calisthenic exercises and fancy marching by the several corps of his regiment, both boys and girls, which corps have become famous, and reflect credit equally upon Guelph and their instructor.

When the exercises had concluded, Dr. Cassidy, Toronto, Chairman of the Provincial Board of Health, gave an address on "The Advantages of Physical Culture."

The Mayor, W. G. Smith, Esquire, thereafter made a formal address of welcome to the Association, it being followed by an address by the President of the Board of Trade, Colonel Higginbotham, who said :

Ladies and Gentlemen : The Mayor voices the citizens of Guelph in reference to the City of Guelph. I would not say more than that. The Board of Trade extends a cordial welcome to the gentlemen who compose this conference. The Board of Trade, from a business standpoint, has been cognizant of the work done by your Association. I feel, Mr. Chairman, that as you have said, the gentlemen who are here have not had an

opportunity of seeing all they should of the city. I feel thankful that my lot has been cast in the City of Guelph. I watched it from the time it was a village, and I do not think there is a more beautiful city in the Dominion. The General Hospital, waterworks and other public buildings are a standing monument to the liberality of the city. Guelph is located in the Garden of Canada, where farming is best carried on. In our midst we have also manufactories, we have fine churches, hospitals, etc., and we have energetic men. Then, to see that the liberality of the people is not confined to the city, I ask you to visit the House of Refuge in the county.

I further voice the words of the Mayor in welcoming you to Guelph, and desire to say that if any time you gentlemen cannot agree as to another meeting place, I say to make Guelph your meeting place again, and you will be as cordially welcomed.

Mr. CHIPMAN, the President, said : I recognize it as a pleasant duty to reply to your kind welcome to the Royal City of Guelph given this morning and afternoon by your citizens. You have mentioned that you have obtained certain advantages from our meeting already. I am sure we have received some in return. When we decide on visiting a place we are interested in the conditions of such town. We examine the waterworks, sewerage system, scavenging system, and other elements of sanitary interest. If there were more gentlemen had such aims and objects as the Health Officers' Association, public work would be much lightened There would be less disease to combat.

The President's annual address was then delivered by Willis Chipman, C.E., Toronto, and was followed by a paper by Dr. W. H. Lowry, Guelph, on "The Sputa of Consumptives as a cause of Disease." Owing to the absence of Prof. J. Mills, of the Ontario Agricultural College, Guelph, Dr. A. Groves, Fergus, read a paper on "Notes on the Prevention of Disease."

The Association adjourned at 10 30 p.m.

FOURTH SESSION—WEDNESDAY MORNING.

The Association met at 9 a.m. The Rev. Mr. Freeman opened the session with prayer.

Moved by Dr. Bryce, seconded by Dr. Hodgetts, that the First Vice-President take the chair in the absence of the President.

Dr. N. Walker, Toronto, read his paper on "The Epidemiological Aspect of Outbreaks of Specific Diarrhœa."

The discussion on the papers read by Mr. D. McCrae, Guelph, on "Sanitary Needs of the Farm," "Pure Water on the Farm," by F. T. Shutt, Ottawa, and "Toronto Water Supply," by Dr. J. J. Cassidy, Toronto, thereafter took place.

Dr. SHEARD said: As some of the members seem interested in the Toronto water supply, I will make some statements regarding the same. To begin with, in the paper read by Mr. Shutt, he dealt very forcibly upon the necessity of a chemical analysis in order to decide the water supply. I know, however, that something more must be enquired into regarding the purity of the water supply. We have had this experience in Toronto again and again. I have had many chemical analyses made at different times. I know of one hundred chemical analyses of our water, and that they reported in every instance the water to be first-class. I would say that there are instances where chemical knowledge does not go far enough. I refer to the bacteriological analyses of the Toronto water supply. I may say that the chemical analyses failed to reveal any difference between the water at the intake and the reservoir. I now present a map of the analyses showing the condition of the water. To show that there is a difference in water at the different points as shown by the biological analyses, I held that the conduit at certain points was leaking. Investigations have proven the truth of the analyses. The difference between water at the intake pipe at Hanlan's point and the tap are seen to be perfectly well marked. If we are going to rely upon the chemical analyses of the water, we will often be led astray in the purity of the water supply. I would trust much more to the bacteriological analyses, than to the chemical analyses. We are mostly interested as sanitarians from its pollution with regard to typhoid. Take the range of bacteria in January, when the number per c.c. came nearly to the 1,000 per c.c., allowing nearly three days for the incubation. The following are the number of cases of typhoid at different dates: 111 cases in February, 108 cases in March, 138 cases in April, 15 cases in May. I think it quite within the limits of possibility that the eleven cases of typhoid for June may be even reduced, yet our bacteriological analyses, I regret to say, have been running at 100 or a little less. I think I may safely predict for the months of July and August a low range of typhoid. It is common practice to send in a sample for the analysis, but really we must depend upon the biological analysis.

In answer to Dr. Cassidy, I would say with regard to his remarks regarding a subterranean water supply that sufficient information on the same has not yet been had as to the quantity which can be supplied. We have Chatham as an example, where the subterranean water supply failed. Barrie has had a similar experience, and if the water at these places has failed I think we might expect to fail. We now require 20,000,00 gallons of water per diem, and will need more in the near future. Apart from the purity, which is yet disputed, of this new water supply, for my part I should be loath to limit the water supply of a city as large as Toronto, or to give it in charge of a private company. We have an illustration in the Gas Company. In the case of handing the water supply over to a private company, we are not sure of the interests which will influence it in its *modus operandi*. I think it is of the greatest importance that the municipality have the governing of its own water supply.

Dr. Cassidy briefly replied to Dr. Sheard's criticisms, and was followed by Mr. Shutt.

Mr. SHUTT: In the first place I do not believe that any single factor can satisfactorily govern the analysis of water. I myself, in examining the City of Ottawa chemically, made the bacteriological analysis of water as well. I would say to this Association that these matters should be made to depend upon the chemical analyses of water. In the instance of Toronto, we have a case which requires particular attention; where the wate is by itself, and we have no history of its past, and with no knowledge as to whether the water has abnormal organic impurity or otherwise, we must depend very largely upon chemical analyses for this; and I trust that the gentlemen present will not carry away the impression that chemical analysis is not of value. It requires a great deal of experience to determine results, and the history of the water in series of analyses should be stated by the analyst.

Mr. MACKENZIE: I am glad to hear Dr. Sheard say that he is experimenting with regard to the water supply from the intake pipe to the reservoir. It is necessary to compare one water with itself and to compare it from year to year, if we would get a true history of the subject of sewage pollution. In Berlin, Germany, they have had bacteriological analyses made twice a week for six years, and have found that these analyses have been invaluable as an index of pollution or bad filtration. Many plates are poured daily. I think it is better, in water sent in from municipalities, to depend more on the chemical analysis than on the bacteriological. The bacteriologist cannot alone settle the question, and

it is not always so satisfactory that we can depend on it implicitly. Thus I have found in samples sent in from a distance for bacteriological analysis, the bacteria increased very rapidly, and if water from a pump or tap be exposed to the atmosphere for some time we find its bacteria has increased very much. In the bacteriological analysis of a water supply, if many samples are taken, its relative purity can be known just as thoroughly as in chemical. Of course these must be carefully collected. Chemical analyses are still valuable as being not so difficult, and the water may remain some time before analysing, without materially affecting the test.

Dr. GRIFFIN : Personally I think that it is very undesirable to allow any private corporation to have the control of the water supply of the city. There are a great many reasons for this, and you have not the control over their action which health interests often demand. The Toronto water supply, has been discussed by Dr. Sheard and Dr. Cassidy pro and con. The obtaining of water from North Toronto has many responsibilities, as shown by Chatham's experience ; as also in Brooklyn artesian wells were bored from fifteen to thirty feet only, and they prefer this to the Croton water supply. It will occur to most persons that the whole question of the water supply is one which has become almost insoluble. If we look at the City of London, about one-half of the Thames water is used to supply the city alongside the river, and where we have a large amount of contamination of these, there can only be a questionably good water by any process. In New York in the Croton water supply has been found sewage from farms, etc., which drained into it, and it is almost incredible that water from such source of supply can be used by the people. Regarding the Toronto case you have the example of the same thing by the sewage being poured into the bay. It will be seen by the various methods being used by the great sanitary engineers what is to be done in Toronto, Chicago, New York, etc. There is one thing to be done, you are not going to drink unboiled water. I believe that man shortly will as soon think of drinking uncooked water as uncooked meat. One town in Massachusetts has a spring to use for drinking water. Chicago has Hygeia water brought to the city. In Chicago they are to-day providing for the use of no water without being filtered.

Water for watering lanes, streets, etc., may be taken anywhere. It is necessary to have the water supply for these purposes, and in the meantime, we should have chemical and bacteriological analyses of it. You have got to boil the water, and should issue a pamphlet to those who are using well water that for the months of June, July, August and September the water must be boiled.

Dr. MACDONALD : I hope the difficulty in obtaining pure water is being overcome. I do not drink boiled water, but recommend it to my patients. Spring water is the best, as everyone knows, and that which everyone wants. Most people, however, prefer to drink water polluted with sewage than to drink it unboiled. I have thought it would settle the question if we would take enough of it ourselves.

Mr. ELLIOTT, of Seaforth, said: We may have better water if we wish ; we have plenty of fine streams and lakes, and it is a disgrace that any sanitarian should have to state such an existence of affairs as at present, especially with regard to the pollution of Toronto Bay by pouring sewage in it, and then spending thousands of dollars to make it pure. I would like to have the opinion of the two members from Toronto, who have discussed this subject, if it could not obtain a pure water supply from Lake Ontario by preventing the pollution by sewage. I see no reason why it should not.

It was suggested at the Niagara Falls meeting that the rivers and lakes should be given up to commercial purposes, and that in some instances the rivers were being turned into sewers and the lakes into cesspools. I maintain the best way to get good water supply is not to contaminate our rivers, streams and lakes.

Dr. CASSIDY : I might answer the question of the last speaker, that the question of the disposal of sewage is intimately related to that of the water supply, and I expressed the opinion then, and I have maintained my opinion since, that the best way to treat sewage is by the Amines process. With regard to land for sewage farms, they cannot be obtained in some of the older countries, but they can be obtained in this country. In England one can have a first-class farm where the sludge can be treated in the open drain, or you make the choice of having the sewage prepared by the sand filter. If possible we must try to keep the lakes pure for the purposes which nature intended the water. I think with Dr. Sheard, regarding Toronto, that while we would like the sewage of Toronto disposed of in some other way, and the water front kept clean, yet it is very difficult to do. We cannot afford to consider the question, as we have not the money. Regarding filtration, diphtheria in St. Thomas has almost entirely disappeared owing to the use of filtered water. Toronto can readily afford in the meantime the expense of filters for ten million of gallons. If you want an impure supply made clean it can be passed through a filter at seven cents per head. With regard to York Township water supply, and with regard to the chemical and bacteriological analyses, I have

nothing more to say than has already been said. Dr. Sheard is a competent man, and when he makes a statement we conclude it must be correct; but it is reasonable to asume that a water, which has not been exposed to the air ought to show fairly good bacteriological results. The supply which has been obtained in North Toronto, and which is now in use, seems perfect, as the community's health is good, and we have not had to allude to typhoid being there. When we hear of persons drinking impure water and have typhoid we immediately believe it to be caused by the water supply.

It seems hard that we should have to use beer, artesian water, etc., when abundant water is present ready to be supplied by the York Waterworks Company at 3½ cents per 1,000 gallons. The city could have control of the waterworks at North Toronto, or allow the Company to have control. Regarding the quantity, I may say that a supply of 4,000,000 would be sufficient only for the northern part of the city. The purity of the supply is of the greatest importance.

Mr. CHIPMAN: Regarding Barrie artesian water supply, I have yet to learn that the works are deficient in supply. They were put in under the eyes of an experienced engineer. One of the wells in Barrie not in connection with the supply became polluted.

Goderich is well supplied with artesians, and the supply continues as large as ever. I cannot see how such waters can be polluted on account of the temperature being 40° or 50° F., and the depth at which they are drawn is in most cases too deep. Any water supply taken from a small stream may become polluted. Imagine a stream with a bank on which a house is situated where a case of typhoid occurs. If the dejecta from the patient be deposited so that it may drain into the stream there may follow an outbreak of typhoid. We have an instance recorded where the opening of a valve caused hundreds of cases of typhoid in Irontown, Michigan.

The discussion on water supplies being ended, Dr. J. W. Coventry, M. H. O., Windsor, read his paper on "Defences of the Province Against Cholera," and was followed by Dr. Bryce's paper on "The Danger of a Smallpox Epidemic." The two papers were then discussed by members.

Dr. ALGIE, Alton, said: In regard to an epidemic of smallpox or cholera, providing a case of either disease existed in Toronto, what protection would municipalities have against infection from these with such rapid transit as at present? This is a practical matter, and deserves the consideration of this meeting. Physicians in Toronto would be advising

people living there to go to the country, which would not be well for the country population. The rural districts, though smaller, should have all the advantages given by the Public Health Act.

Dr. GRIFFIN: Regarding smallpox, vaccination would secure any such country districts against outbreaks. Regarding cholera, arrangements ought to be made that if a case of the disease occurs on the train, that the officers should telegraph to the next station, and the health officer of that place would take charge.

In some continental countries the option of using either human or bovine lymph exists. In Denmark twenty-five years ago they decided on the use of human virus. In the first place, you have with the introduction of the bovine virus the development of the disease greater than before. From my large experience in vaccination I believe that the evils of vaccination are made far more serious under bovine than under human virus. In New York, however, where they have occasion for every day use the bovine virus is used. A great many medical men are in favor of bovine vaccine.

Our board of health at Brantford, taking powers under the vaccination law, forbade the admittance of children into school, but this is not likely to last long.

I think Dr. Macdonald will confirm me in this. If it is permissible in other countries to use either of these viruses, why should we not? Vaccination in the schools should be done by one person, and not by the profession at large.

Dr. MACDONALD: I have not had a great deal to do with bovine virus. I have seen a great deal more trouble caused by bovine than by human virus. I remember my first experience with vaccination. There was at that time no charge for vaccination. We never, at that time, saw cases of smallpox, in spite of the trade being carried through the district; and I do not remember hearing my teacher speak of his having one. We carried virus about in a case and threw it away when it got old, and in these years, though smallpox was not unknown, yet there were not many cases in the part of Scotland where I lived. Cases in Hamilton, a number of years ago were caused by immigrants. At that time nothing but human virus was used. Great care was taken to see that vaccination was successful, and very soon the cases of smallpox ceased. I have often vaccinated myself, first when about twenty years old, though I never had any dread of the disease. I am general examiner of an insurance company, and as many of you know, one of the questions is whether the applicant has

been vaccinated, and if they have not, they cannot obtain a policy until the same has been successfully performed. The most difficulty in having people vaccinated has been with strangers. I would think that a large majority of the country had been vaccinated. One hears more of smallpox now than twenty-five years ago.

Dr. WALKER : My friend Dr. Stephens, of Collingwood, got vaccinated by using bovine virus, and then vaccinated from arm to arm, and after using the same lymph a few times, it became so strong he had to stop that series, and start again with fresh bovine. He gave notice that he would vaccinate the people at the hospital free, and only five children came. In England I have obtained some information regarding vaccination. They get vaccine from the farm and keep account of every child vaccinated.

My experience of compulsory vaccination of immigrants on shipboard was not such as to inspire confidence. We were so inadequately supplied with lymph, that I proposed to vaccinate a few arms immediately on leaving Queenston with a view to further vaccination from arm to arm, but owing to rough weather, this was found to be impossible. During the last days of the voyage we vaccinated something like six hundred persons with a solution of vaccine and water, mostly water, and supplied each one with the all-necessary certificates. Nominal vaccination is no use, and if the Government requires it at all, they should see that it is efficient.

Dr. CAMERON : Regarding the experience of Dr. Stephens in using bovine virus after vaccinating different persons on the arm with it, and its gaining in potency, the question is, Did it gain strength as bovine virus or as human virus ?

Dr. BRYCE : In 1885, when we had such an experience with regard to vaccination, I made enquiry regarding the vaccination of probably 80,000 persons that year, from, in almost every case, bovine lymph supplied by various vaccine farms, and tabulated the pros and cons. I could not find that more severe symptoms occurred than when vaccinated directly from arm to arm. In my own experience—and I had a great deal—I found in one case that when I took the virus from a strong young man to a child in one instance there resulted in an abscess. People object to human virus on account of the danger of getting other diseases. The real reason is that people do not like to be hurt. There is not, ordinarily, a sufficient alarm to cause people to bother with vaccination. If our cities keep growing in size, we will have large communities growing up unvaccinated, and from time to time, we may expect to have outbreaks of smallpox amongst them. Then we must decide who is to do the work of vaccinat-

ing, which ought to be by lymph furnished to the public vaccinators. There is a point of some infection from something, filthy clothes, etc., as being a greater danger than from the disease itself. This points to the necessity of dealing with cleanliness of the part, in vaccinating. All fresh and well taken lymph will then be satisfactory. If anyone working in a scientific way shaves off any hair and all other impurities, thereafter washing with a disinfected cloth, and then takes an instrument which is innocuous, or take a disinfected vaccine point dipped into fresh lymph from the pustule of a calf, I would feel certain of good results, only I would not allow a child to be vaccinated without antiseptic precautions. Until the doctors understand and explain to their patients how the system must be protected by rest, etc., they will have sore arms and sickness. There is a necessity for vaccination in our schools in a scientific way.

Dr. COVENTRY : I think quarantine by adjoining cities against smallpox, diphtheria, or scarlet fever useless. The health officer of the municipality where disease is supposed to be on the alert, and the municipalities interested should be warned by information to their health officers. I know by experience that if you prevent an individual from leaving a place in daylight he will go by night. There is no possibility of preventing his reaching another point unless he is unable to travel. I do not think there is much to alarm us this year in the matter of cholera, but would urge that the health authorities look after the conditions of their municipalities. Have a car at the station, and if a case of it is known to be in the country, and a car is there, then it can be quarantined; or a carriage might be kept to carry a patient to a building or tent placed at the disposal of the board for such patient. Have nurses, and see that a certain amount has been provided for bedding, etc., so that the case can be intercepted. These are the instructions I would urge upon the health officer to take.

Mr. MCCRAE : The public health of our township has been considered by the board should cholera come. The chairman has prepared a pamphlet which would be distributed through the county. There is no need at present for taking these precautions, as cholera has not come, but our pamphlet is ready to be used when necessary.

The discussion on cholera and smallpox was then concluded.

J. H. Reed, V.S., Guelph, read a paper on "How to Purchase Safe Dairy Cows;" Dr. H. B. Martin, Erin, read a paper on "The Public Health Act in Rural Districts;" followed by a paper by Alan Macdougall, C.E., Toronto, on "Systems of Sewerage Available for Ontario Towns and Villages."

Dr. Bryce read the Report of the Council of the Association for 1892-93, which, on motion of Dr. Bryce, seconded by Dr. Macdonald, was adopted.

Dr. HALL, Chatham, said: I believe, according to the arrangements made by the Council held in Toronto in March, that two meetings of the Executive Health Officers Association were to be held this year, one in Guelph and another in Chatham. At that meeting I presented a very cordial invitation from the Mayor of Chatham to hold a meeting in Chatham this year. One reason is that this Association is missionary in one respect, going from place to place doing good sanitary work. We have a great many sanitary heathen in most of our towns who hinder the work of the board and its officers. I always imagine that, after a meeting of this kind, the board and its people would be greatly enlightened. We shall be very glad to have you either this year or next, if it is thought that there might not be a good representation this year. The work we are looking forward to, is the sewerage system for the town, and I had hoped it would have progressed more than it has. The prospects are now that, if the meeting was held early next year, it would do more good than if held this fall. Our people are looking forward to this meeting, and the Council, Board of Health and people of the town intend to give you as good a time as possible. They will be disappointed when I tell them you will not be coming till next year.

DR. BRYCE: Under the circumstances I move the matter of the next meeting be referred to the Executive for final decision, both this year and next.

Dr. BRYCE gave his report as Treasurer, which is as follows:

To the President and members of the Executive Health Officers' Association of Ontario:

GENTLEMEN,—Your Executive Committee begs leave to present its annual report for 1892-3.

The Executive Council met in Toronto at the call of the President on March 2nd, 1893, to discuss the question of the next meeting.

After a discussion of the various invitations it was decided to hold the annual meeting in Guelph, and another meeting in Chatham later in the year. No special work has been undertaken by the Council during the year.

The Secretary reports that he has on hand $224.91.

All of which is respectfully submitted.

P. H. BRYCE,
Secretary-Treasurer.

Dr. BRYCE : The Association has really no expense at present. It has been the habit to ask the Provincial Board of Health to print the proceedings. The proceedings and programmes have been printed by the Board for the Association.

Mr. CHIPMAN : I would suggest the question of printing the proofs of the papers before the meeting, so that our time will be taken up in discussions in place of reading of papers, and would suggest that part of the same be kept ready for the meeting.

Mr. ELLIOTT, Seaforth : If the money is on hand I would suggest the advisability of using it by issuing pamphlets, publications, or a periodical.

The printing of a periodical was not approved of by the Association.

ELECTION OF OFFICERS.

The election of officers was then proceeded with, and resulted as follows :

President—Allan Cameron, M.D., Owen Sound.

First Vice-President—Alan Macdougall, C.E., Toronto.

Second Vice-President—H. Howitt, M.D., Guelph.

Secretary-Treasurer—P. H. Bryce, M.D., Toronto.

Council—W. R. Hall, M.D., Chatham ; J. W. Coventry, M.D., Windsor ; Chas. Sheard, M.D., Toronto ; E. Griffin, M.D., Brantford ; M. McCrimmon, M.D., Palermo.

Moved by Dr. Coventry, seconded by Dr. Vaux, "That this Association desires to express its thanks to the citizens, Mayor and Aldermen, the Chairman, Medical Health Officer and members of the Local Board of Health, and especially to Captain W. Clarke and his class, and the Board of Trustees of the Hospital, for the many attentions and continued hospitality extended to its members during the session of the Association in Guelph." Carried.

On the motion of Dr. Bryce, seconded by Dr. Sheard, the Association adjourned at the close of the session.

The members of the Association were driven to the Ontario Agricultural College, where they had an opportunity of examining the various extensive laboratories and other buildings where College work is carried on, and of seeing the Experimental Farm at the most delightful season of the year.

MEMBERS EXECUTIVE HEALTH OFFICERS' ASSOCIATION OF ONTARIO FOR 1893-94.

Willis Chipman, C.E., Toronto; Dr. J. J. Cassidy, Toronto; Dr. J. D. Macdonald, Hamilton; Dr. E. E. Kitchen, St. George; Dr. J. W. Coventry, Windsor; Dr. E. Griffin, Brantford; Dr. C. Sheard, Toronto; Dr. N. Walker, Toronto; Dr. C. A. Hodgetts, Toronto; Dr. P. H. Bryce, Toronto; Dr. H. Howitt, Guelph; Dr. A. McKinnon, Guelph; R. Melvin, Guelph; F. T. Shutt, Ottawa; D. McCrae, V.S., Guelph; Dr. W. H. Lowry, Guelph; Dr. H. S. Martin, Erin; Robert Barber, Toronto; A. Macdougall, C.E., Toronto; J. J. Mackenzie, Toronto; Dr. H. E. Vaux, Brockville; Dr. D. P. Bogart, Whitby; Dr. A. Cameron, Owen Sound; W. G. Smith, Guelph; Col. Higginbotham, Guelph; Dr. W. R. Hall, Chatham; William Elliott, Seaforth; Dr. Watt, M.P.P., British Columbia; Dr. S. Lett, Guelph; Dr. F. Howitt, Guelph; Dr. M. McCrimmon, Palermo; Mr. Stroh, Waterloo; Dr. J. Algie, Alton; Samuel Ryding, Toronto Junction; Mr. Fichey, Norwich; Dr. W. O. Robinson, St. Jacobs; Dr. S. Snyder, Elmira; J. S. Wideman, St. Jacobs; Dr. J. A. Robertson, Stratford; Mr. J. Barber, Alton; H. J. Bowman, Berlin; Dr. A. Stewart, Palmerston; Dr. C. Macdonald, Tilsonburg; Dr. J. Wallace, Alma; Mr. J. Watt, Guelph; Alderman Kelley, Guelph; Dr. J. H. Kennedy, Guelph; Alderman Hewer, Guelph; Dr. W. O. Stewart, Guelph; Mr. R. Melvin, Guelph; Mr. G. Mertin, Guelph Dr. D. Nunan, Dr. J. M. Cameron, Arthur.

PRESIDENT'S ANNUAL ADDRESS.

By Willis Chipman, Esq., C.E., Toronto.

Ladies and Gentlemen,—As President of the Association of Executive Health Officers, it becomes my pleasant duty to tender the hearty thanks of the Association to the Mayor for his kind address of welcome. In accepting the invitation to hold our annual convention here, we have been accorded a royal welcome to this Royal City.

When I first became a member of this Association, in 1888, if I had been told that in five short years I would be occupying the President's chair, I am certain that such an announcement would have destroyed my usefulness as a working member, and might have driven me out of the ranks in despair. The honor conferred is a grateful tribute paid by the medical profession (who constitute the great majority in this Association), to their co-workers, the sanitary engineers.

It is customary for the President to select some theme or text for his annual address, interesting alike to the members of the Association and to the citizens of the town, whose guests we are.

This year, the annual address will be very brief. I propose, first, to give a summary of the work we are engaged upon, as viewed from the standpoint of the sanitary engineer, and make some observations on the work that should be entrusted to our profession.

For the information of the public and members who have joined us this year, I may be allowed to state that this Association was organized in 1886, the first meeting being held in Toronto, the second annual meeting in Woodstock, the third in Lindsay, the fourth in Brockville, the fifth in Owen Sound, the sixth in Trenton, the seventh in Niagara Falls, and this, the eighth, in Guelph.

The work done by the Association is slowly but surely becoming appreciated by the thinking public, and the seed sown at our annual convention is certainly bearing fruit.

The field of our labor is a broad one, apparently limitless. We are fighting an uphill battle against "dirt" and "ignorance," and

their sequences, "disease" and "crime." We are engaged, collectively or individually, on a diversity of problems, but all for the good of mankind. We sanitarians are endeavoring to promote such principles as will secure for the rich and poor alike the great necessities of existence. The first great necessity of existence is "food." We determine what is wholesome, what unwholesome, and discuss its adulterations. We have done very much towards improving the milk supply in the different cities and towns of the Province, and our papers on diseased meats and decayed vegetables, must serve a useful purpose.

The second great necessity of life is "warmth." We are interested in the proper construction of buildings, their heating and ventilation.

The third great necessity of life is "water," its source, its composition, the topography and geology of the locality from whence procured. We must also take into consideration the meteorology of the district, while the bearing of astronomy may have a greater influence than is popularly supposed.

The fourth great necessity is "pure air." The disposal of organic wastes involves sewerage and scavenging.

There is work outlined here for the sanitary engineer, the chemist, the bacteriologist, the architect, the geologist, and even "Old Probs," F. R. S.

To become a successful sanitary engineer, it is necessary to acquire a knowledge of these cognate subjects. I therefore submit that the responsibilities of the sanitary engineer are greater than those of any other profession on sanitation, as our works affect the health of the community in a wholesale way.

What is there here for the medical profession? If every man were provided with wholesome food, pure water, pure air, and housed in homes properly heated and ventilated, the world might get along quite comfortably without this profession, after the diseases inherited from our ancestors, had exhausted themselves.

A glance at our membership roll discloses the fact, however, that for every sanitary engineer there are about ten medical men, and as the income of each of these is about double that of each of the sanitary engineers, we must conclude that the work done by

that section of our Association is twenty times as great as that done by the engineers. What are they engaged upon? Many diseases are caused by impure water, impure air, unwholesome food, extreme temperatures. In this Association we are chiefly interested in the prevention of disease, especially the spreading of infectious diseases. The designing of hospitals, hospital appliances, vaccination, disinfection, isolation, quarantine, hygiene, etc., are the problems which can be properly delegated to the medical profession; while the designing and construction of sewerage works, waterworks, garbage crematories and public abattoirs, the maintenance of such works, the cleansing of streets as well as their construction and maintenance; and systematic scavenging, are problems in sanitary engineering; but how often do we see these works entrusted to incompetents!

In the Queen City, our provincial capital, the great question of water supply has been for several years in other hands than those of the sanitary engineers, with deplorable results both financially and from a sanitary standpoint. In a great number of the cities and towns of Ontario the same story can be told as in Toronto, and with sewerage the record is even worse.

There is an ever-widening field for the sanitary engineer. We are now educating the "flower of our nobility" at our great University, at the expense of the country, and I know for a fact that many of these young graduates who desired to take up sanitary engineering and were educated therefor, have been forced to emigrate in order to get employment. Four of my own assistants of last year are now with "Uncle Sam." This should not be. The people of this country are supposed to be intelligent; but in the cities and towns we find a vast amount of useful energy dissipated by politicians, by business men and by professional men (even doctors) on engineering problems which are beyond their province, and which should be placed in the hands of properly qualified persons. We hope that in due time, when all our politicians have become statesmen (what grand opportunities here present themselves), when our lawyers will follow common sense, as well as the precedents of the Middle Ages, and our legal machinery will be so simplified that it will be a crime to allow a simple man to spend a thousand dollars in an attempt to gain one dollar, when the "punishment will fit the crime" (the criminal not being in this case the simpleton), when

physicians will be employed chiefly in preventing disease instead of the curing of it, then the public will have time to inform themselves as to the advantages of employing sanitary engineers, and that they will then have the money to complete necessary engineering works.

I now come to the second part of my address :

In return for our hospitable entertainment, it is expected that our Association should advise the Local Board of Health on the sanitary problems that it is more particularly interested in, at the present time. Waterworks, sewerage, scavenging, infectious diseases are all represented in our programme, and we invite a full attendance of the citizens at all our sessions.

Your city has now a public water supply, and I may be permitted to give you some proofs that a sewerage system would improve your sanitary condition. Unfortunately, it is necessary to go to Europe for the more convincing proofs, owing to the chaotic state of our vital statistics.

As the basis of sanitary science is vital statistics, we require the aid of every medical health officer in the country, on this work. A uniform classification of diseases should be adopted, and the number of cases should be reported, as well as the mortality from each cause. It is now about twenty years since returns of the births, marriages and deaths from each municipality were first sent in to the Provincial Government. One of the greatest boons that the Government could give to sanitarians would be a compilation from these accumulated returns, classified and tabulated, showing, diagrammatically or otherwise, the advances made in health work. We hope a Dr. Farr may soon rise up in our midst if the Government does not awaken to the importance of this work.

The decrease in the mortality of London, England, since 1660 to 1680, when it was as high as 80 per 1,000 (now being but little over one fourth of this) is probably well known to many of you, and it can be shown that, to a great extent, this is due to the introduction of waterworks and sewerage. At the Vienna Sanitary Congress, held a few years ago, it was brought out that sewerage had a remarkable effect on the mortality from enteric fever, as the following extract will show :

MUNICH.

Enteric fever mortality per 1,000,000 for quinquennial epochs.

Epochs.		
1854-1859.	No regulations for keeping soil clean...	24.2
1860-1865.	Reforms were begun by cementing the sides and bottoms of porous cesspools	16.8
1866-1873.	When there was partial sewerage.....	13.3
1876-1880.	When sewerage was complete.....	8.7

FRANKFORT-ON-MAIN.

per 10,000.

1854-1859.	When there was no sewerage.....	8 7
1875-1880.	When sewerage was complete.....	2.4

DANTZIG.

per 100,000.

1865-1869.	When there was no sewerage and no proper water supply.....	108.0
1871-1875.	After introduction of water supply	90.0
1876-1880.	After introduction of sewerage	18.0

Granting that sewerage will improve your sanitary condition, promote cleanliness, and add to the comforts of home life, the questions of cost, and of system are to be decided upon. After this the hardest work begins—honest doubters are to be converted, prejudices overcome, false theories exploded, and fancied evils shown to be angels in disguise. Then the "croaker" must be prescribed for. Disinfection, isolation and printer's ink are among the most effectual remedies; they will prevent the spread of the disease—to cure is impossible.

You have no doubt heard considerable pro and con respecting the separate system of sewerage, which has now a strong foothold in the Province. Brockville was the first town in Ontario to introduce the system, and I had the honor of being the engineer from the commencement of the works in 1887, until their completion in 1891, and I know something of the efforts necessary, before construction can be commenced. The greatest objection to the separate system is

made against the small sizes of the pipes. When visiting Rome, the *Cloaca Maxima* is, of course, one of the sights, and being saturated with guide-book lore, the majority of visitors are ready to fall down and worship.

The vivid description of the Parisian sewer system as it was some years ago, by one of the greatest, if not the greatest, novelists, has done even more than the *Cloaca Maxima*, to implant in the minds of the majority of people, first, that sewers must be large, and, secondly, that sewers must of necessity be dirty, synonyms for everything dark, and damp, and foul, and loathsome; putrid and noisome.

These conceptions of sewers are very deeply rooted in the public mind, as I know from my experience in every town and city in Ontario, where I have constructed sewerage works. Builders and contractors, for obvious reasons, are prejudiced in favor of large sewers. You must expect the same opposition here if the separate system be recommended. Four years' use of the sewers in Brockville has converted nearly all thinking men, to the belief that no mistake was made in adopting the separate system.

Cornwall, Barrie, Brantford, Berlin, Toronto Junction, and possibly other places in Ontario, have followed the example of Brockville, modifying the system as local requirements demanded.

You may be interested to know the cost of such works in some of the places I have mentioned.

Brockville spent about $100,000 on 8¼ miles of sewers, or an average of about $2.25 per lineal foot of sewer.

Cornwall has constructed between three and four miles at a cost of about $1.50 per lineal foot.

Barrie has constructed about three miles of sewer at a cost of less than $1.50 per lineal foot.

In the city of Brantford, about twelve and one-half miles of sewers have been constructed at a cost of less than $2 per lineal foot.

In Toronto Junction, the cost of constructing five miles of sanitary sewers last year was somewhat less than $1.75 per lineal foot on an average.

I have not the cost of the work in Berlin, but it would probably be about the same as at Toronto Junction. These costs are moderate compared with the great benefits to be derived.

Waterworks and sewerage, however, cannot take the place of systematic and thorough scavenging. Eternal vigilance in this respect must be the watchword with every health officer.

I will now close by giving a sanitary prescription which has given great satisfaction when followed:

Rake	1 (one)
Shovel	1 (one)
Wheelbarrow	1 (one)
Chloride of lime	1 oz. (one)

Directions: Use vigorously for an hour or two every twenty-four hours until relieved.

DIPHTHERIA EPIDEMICS, AND HOW CHIEFLY PROPAGATED.

By C. A. Hodgetts, M.D., Toronto.

Mr. President and Gentlemen,—Although the name Diphtheria was almost unknown in English medical literature until 1859, when the Sydenham Society published a volume translated from French writers, noticeably Bretonneau, yet we are not without conclusive evidence of its existence, like other specific diseases, as long as the history of man extends. We have traces of it over two thousand years ago, and the descriptions recorded of it a thousand years back apply equally as to its appearance at the present time. Hippocrates describes it, and gives us the name of its first recorded victim. It has attracted the attention of all the old writers, and many and various have been the names accorded to it. No doubt some of the plagues of the Dark Ages may claim this disease as their agent.

Its first appearance, as an epidemic of which we have any explicit writings, is in Spain from 1581 to the close of the century. It next attracted attention as an epidemic in Naples in 1618, subsequently in the island of Sicily. From this date it does not appear to have assumed an epidemic character, at least sufficient to be worthy of mention by the writers of the day, until about the middle of the eighteenth century when it appeared almost simultaneously in Italy, France and England. Dr. Starr, in 1749, writes of its appearance in the latter country as follows:

"The *morbus strangulatorius*, with great propriety and justice denominated, has within a few years raged in several parts of Cornwall with great severity. Many parishes have felt its cruelty, and whole families of children, whence its contagious nature is but too evident, have, by its successive attacks, been swept off. Few, very few, have escaped."

"Many in the first attacks have complained of swellings of the glands, but frequently of no great importance, a few from an internal tumor have had a large external œdematous swelling of the sub-

cutaneous and cellular tunic from the chin down to the thyroid gland and up the side of the face. Not a few, early in the disorder, have had gangrenous sloughs formed in their mouths, and perhaps so early in some that the disorder was scarce complained of, till the slough was formed, so quick has been its progress." Again, "I have not mentioned a *fœtor oris*, because, though some have had it, others have had it not." Speaking of a slough found in the expectoration, he says : "Also, I have seen such a slough on the skin of one of these patients in the neck and arms where blisters had been applied." . . . . "This white surface had the aspect of an over-soaked membrane, which being oversoaked had become absolutely rotten."

A century elapsed before the disease again assumed epidemic proportions, although outbreaks of more or less intensity are recorded as having occurred in France, Germany, Great Britain and North America.

During the epidemic in Paris about 1807, a promising member of the Bonaparte family was the occasion of the disease receiving a large amount of medical attention. It was again most fatal from 1855 to 1857 in France, and in England it attained its highest mortality in 1858 and 1859, when there was an average of ten thousand deaths for each year.

The appearance of the disease in America is first described by Dr Samuel Bard, of New York, in the latter part of the eighteenth century, and its continuance is noted at different times in medical periodicals, before it again assumed epidemic intensity, which it did in California in 1856 and 1857, and at a later date in the Northern States of America, from whence, no doubt, it found its way into Canada. Indeed, that which commenced as an epidemic in France, in 1857 and 1858, spread along the avenues of commerce, becoming pandemic, invading the whole of Europe, North America, Asia, Africa and Australasia.

The disease is comparatively more prevalent upon this continent than in Europe, its ravages extending alike to the less populous districts as to the more crowded centres, showing no decided prefer-

ence for inland districts as compared to towns and cities upon the line of the Great Lakes or on the seaboard.

It is generally acknowledged now that diphtheria is primarily a local infection with secondary constitutional disturbances, and that it is caused by the Klebs Loeffler bacillus.

Dr. Loeffler himself submits the following propositions in the "Med. Monat," October, 1890:

1. The cause is the diphtheria bacillus, to be found in the diseased mucous membranes.

2. With this excretion may be cast forth the bacillus.

3. Patients pass bacilli which are capable of producing infection . . . for some days after all deposits have disappeared.

4. Patients should be carefully isolated as long as bacilli are found in their secretions.

5. The bacilli will retain vitality in portions of membrane for four or five months, hence disinfection thoroughly, clothing boiled or disinfected with steam at 100° C., rooms scrubbed with sublimate solution (1 to 1000) and walls rubbed with bread.

6. Vitality of bacilli greater in moist than dry media, hence damp and dark dwellings should be made dry.

7. Bacilli thrive outside the body at 20° C., they develop readily in milk.

8. Lesions of the mucous membranes of the *prima via* favor the reception of the virus.

9. During the prevalence of the disease as a prophylaxis the cleaning of oral, nasal and pharyngeal cavities of children with sublimate solution (1 in 10,000).

Let us briefly review the principal factors or predisposing causes considering them in their bearings upon epidemics of this disease. So widespread is it in its geographical distribution, no part of the habitable globe being free from its ravages, that the *geological formation* of a district may almost be excluded as a factor, indeed districts possessing the same geological formation show opposite contrasts in regard to its prevalence. Certain districts, no doubt, where the surface soil remains moist and damp, the water being unheld by clay or rock, produce inflammatory conditions of the tonsils and throat, affording a prepared *nidus* for the infection. The effect of

the *seasons* upon the number of cases is well known to all. With the advent of the Fall there is generally a marked rise in the number of cases.

Dr. Thorne Thorne, speaking in his Milroy lectures, 1891, in regard to this, says, after reviewing a long period of years, "that the excess of mortality had been during the last quarter of the year—a marked rise occurred in the month of October, continuing during November, gradually decreasing in December." Dr. Bryce, in writing of this in the Annual Report of the Provincial Board of Health, 1886, gives a table showing the deaths by months in Baltimore, St. Louis, Chicago, New York and Province of Ontario. The deductions from his table are pretty much in accord with those made by Dr. Thorne for his English ones, with the difference that the increase on this continent begins a month earlier, viz., September, and continues in severity for a longer period.

Coincident with this I would quote from *Mackenzie, who shows that during four successive years the months of September, October and November show the highest number of cases of tonsilitis. Have we not here one reason to account for the rejuvenescence of diphtheria occurring as it does at a time when receptivity would be great? That there should be an excess of females attacked over males, is due chiefly to the fact that they are brought more in contact with the sick, than to any special predisposition on the part of the sex.

Certainly a review of the mortality returns for the years 1888 and 1891 inclusive, shows no marked difference in the death rate of the sexes.

Year.	Male.	Female.	Total Deaths.	Percentage of Deaths.	
				Males.	Females.
1888.....	443	471	914	48.46	51.53
1889.....	240	226	466	51.05	48.49
1890.....	346	371	717	48.25	51.74
1891.....	447	504	951	47.00	52.99
	1476	1572	3048	48.42	51.56

*Osler's Practice of Medicine.

Possibly that *period of life* bounded by three and fifteen years is the one during which diphtheria scores its greatest number of victims. This is also the age limit of school life to most people. This prevalence is chiefly owing to the fact that at *school* children are thrown so closely together, often in ill-ventilated and overcrowded and overheated rooms, with sanitary surroundings such as conduce to weaken the general health of the pupils. The associations in class occur, perhaps being more marked in the kindergarten department, there exist class recitation and singing, and even during the play hour the little ones are more closely associated in the games of childhood and the sharing of sweetmeats and cakes.

Referring to *water* as a cause of epidemics, Dr. Thorne says, "No prevalence of diphtheria has even been definitely traced to polluted water or water containing fungoid or other allied growths." In this connection let me quote briefly from the report of an epidemic which happened in Northern Vermont in 1879 (annual report of the National B. of H., 1879), supposed to have been caused by school children drinking of water from a polluted brook. On examination of the water nothing was found "immediately detrimental to health," but the inspector's investigation showed the outbreak due to the return to school of a child still infected with diphtheria. Here bad sanitary conditions, which I fear too often exist in schools of a similar class in this country by weakening the health of the children, made them fit subjects to receive the contagion. In seeking for some nuisance to explain an outbreak investigators have laid great importance upon *sewage* and *defective drainage* as causes. Certainly during the past twenty years great progress has been made in the drainage and disposal of sewage, not only in this country but throughout the world generally, and yet during the same period of time the greatest increase in the disease has been in the rural districts where it is certainly more virulent. The improper disposal of the former and grave defective condition of the latter may produce in some cases a non-contagious character of sore throat whereby a receptivity on the part of an individual is produced for the rapid development of diphtheria, upon becoming infected with it—or

retained in the drain or contained in the sewage may be the the contagium received from sputa or dejecta of a previous case. perhaps finding its way into the house through some defective joint or trap, wafted thither by ' sewer gas.' The bacillus diphtheriæ no doubt retains its vitality for some time, but how long at present is not known. A most interesting case, showing its vitality for at least eighteen months after exposure to summer's heat and winter's frost and snow, was reported to me about a year ago

At a farm house wherein happened diphtheria in the Parry Sound epidemic of 1889, some eighteen months subsequently a settler who had but recently moved into the house cut his foot whilst chopping in the yard and staunched the blood flow with some old rag lying on the ground. The wound not healing, he in the course of a few days sought medical aid. The doctor pronounced the case as covered with a membrane diphtheritic in character, and I am credibly informed a case or two of diphtheria occurred in the family subsequently. The old rag no doubt had been used by one of the former residents whilst ill with diphtheria, thrown out into the yard, lain there all those months and was the cause of the trouble.

The first to show any direct relation between an outbreak of the disease and the consumption of milk from the same source by families was Mr. Power in his investigation in North London in 1878. He then suggested the probability of contamination of the milk by cows suffering from some specific disease. In 1882 an outbreak at Hendon was the subject of investigation for the Local Government Board by Dr. Cameron and Mr. Power. Ninety per cent. of the households attacked received milk from the same dairy. No disease in the cows was made out however.

In 1886 at York, town and district similarly, over 80 per cent. received milk from the same source.

These and other prevalences of the disease led to experimental research carried on by Dr. Klein during the past two or three years.

A brief review of these very interesting and important experiments, as reported in detail in the L. G. B. reports for the years 1889, 1890, etc., is as follows :

"Dr. E. Klein reports in the Local Government Board supplement, 1890, a series of most interesting experiments with bacillus diphtheriæ on animals, five experiments upon cows inoculated subcutaneously. In the first case:

No. 3 was inoculated with broth culture derived from cow No. 1 of the previous year. No. 4 was inoculated with agar culture.

No. 4 was found dead on the 11th day of experiment, and No. 3 was found dead on the 17th day of experiment from the hæmorrhagic necrotic muscular tissue of an abscess which formed in each case; pure cultivations of bacillus diphtheriæ were obtained. In neither cow was there any diphtheria bacilli demonstrated by cultivation of the heart's blood or that from liver, lung or spleen.

And in neither cow was there observed at any time any abnormal condition of the skin of the teats or udder; milk, too, taken from the cows on April 26th, on the 8th day after inoculation, was examined by the culture test; no diphtheria colonies were obtained.

From these two experiments it is seen that the bacillus diphtheriæ derived from the local tumor of cow No. 1 produced in the other cows intense pathogenic action; action fully as virulent as that of the bacillus derived from human diphtheria membrane which was used in previous (1889) experiments for inoculation of cows Nos. 1 and 2. The local inoculation effects and the visceral disease produced in cows No. 3 and No. 4 were moreover identical with those produced in cows Nos. 1 and 2. Nevertheless cows Nos. 3 and 4 showed no disease of the udder, and diphtheria bacilli were not found in their milk at a date subsequent to inoculation corresponding to that at which the milk of cow No. 2 of last year's experiments had been discovered to contain the diphtheria organisms.

Cows Nos. 5 and 6 were inoculated in a like manner in this experiment with culture from a human source; after eighteen days previously having been inoculated with cultures which had lost their virulence as shown by a concurrent test upon guinea pigs, without showing any effect upon their local or general condition; the animals were killed on the 16th day of second inoculation; the cultivations were pure but few, at no time was there any abnormal condition

noticed on the teats or udders, and milk taken on the 8th day and 12th day yield no single colony of bacillus.

Milch cows Nos. 7 and 8 were treated similarly but with a broth sub-culture of human diphtheria bacillus, which, during the previous twelve months, had passed through many series of culture.

In both these cases an eruption appeared upon the udder between and about the teats of small round pimples and pustules $\frac{1}{6}$ and $\frac{1}{8}$ inch in diameter. Milk taken from No. 8 on the 25th day (aseptic precautions being observed in the milking) yielded upon culture the diphtheria bacillus, and continued to do so as long as the eruption appeared on the udder. Nos. 9 and 10 were fed with broth culture with negative results, subsequently being inoculated. Each cow had a sucking calf. On the 9th day of inoculation a pustule appeared on the upper lip of each calf similar in character to those on the teat.

Cats. From experiments it seems that by repeated feeding with cultures of diphtheria bacillus distributed in milk, unquestionable disease can be produced in the cat.

Guinea pigs. Conclusion that diphtheria once started in this animal by injection of a living culture of the bacillus it proceeds unimpeded whether or no the toxins of a sterilized broth culture be injected on several subsequent days. If anything, this reinjection rather seems to accelerate than retard its progress.

Two cases are reported of casual diphtheria in the cow.

In an outbreak in Croydon, supposed to be from milk:— The Medical Health Department not having found in the condition of dairy, of employees or distributors, a satisfactory explanation of of the outbreak, Dr. Klein examined the cows and found one animal with two healing ulcers, a second with one ulcer, size 6d., and a third on every teat round sores of various sizes from $\frac{1}{2}$ to $\frac{1}{4}$ inch. Others in the same shed showed evidence of having had similar ulcers; these were like those produced by inoculation and cultivation of the diphtheria bacillus. Again, at Bishops Stortford, a similar condition was found in three cows associated with an outbreak of diphtheria among consumers of the milk.

In both these instances, be it observed, of cow diseases associated with diphtheria among consumers of the milk of the affected cows, we have the same character of eruptive malady in the cow, namely, round ulcers for the most part small, $\frac{1}{2}$ inch in diameter, the others measuring $\frac{1}{8}$ to $\frac{1}{4}$ inch, ulcers of different ages, some older ones contracting and healing, others more recent and covered with thin, brown crusts and in certain of the ulcers a peculiar nodular induration of the base of the sore. These several characters were noticed in the eruption induced in cows by subcutaneous injection of bacillus diphtheriæ.

CASUAL DIPHTHERIA IN THE CAT.

Upon the occasion of the experiments being conducted upon cows No. 1 and 2 and also 7 and 8 at the Brown Institution, cats having been for some days fed on milk of the cows in question, suffered from cat diphtheria, sneezing, running of the eyes, coughing ; microscopic specimen of the membrane from the trachea, revealed a remarkable number of bacillii, which organisms closely resembled typical diphtheria bacilli ; the disease only occurred when there were cows under experiment.

We have here the reports of 36 epidemics, five happening in this Province, five in neighboring States, and the remainder in England and Wales. In the majority of these epidemics the origin was not ascertained ; this is to be attributed partly to the fact that the period of inspection was often so many weeks remote from the actual beginning of the epidemic, and the beginning itself being so insidious the difficulty is great in arriving at some definite conclusion as to origin ; but most frequently preceding and accompanying the diphtheria were reported cases of "sore throat ;" this is given as the case in ten of twenty-six English epidemics. These first cases were so mild in the attack that nothing was thought of their approaching diphtheria in character. Isolation was not insisted on. Of thirty of the thirty-six epidemics, propagation was found to be due to "personal communication," of the remaining six, one was negative as to this cause, but many of the houses affected were "exposed to sewer air."

Two, apparently by other means than personal contagion. Two, not given. One doubtful. In the epidemic at Enfield, diphtheria was observed in domestic animals. Of the twenty-six English cases, fifteen report schools as the places where the personal communication took place between the diseased and uninfected. In fourteen of these twenty-six the sanitary condition of the district is reported to be defective in some particular. The histories of these epidemics are of course too lengthy to be given in detail, but the facts which appear most prominent are: 1. The insidious beginning, the sore throat passing almost unnoticed. 2. The school attendance of these cases of so-called "sore throat," where the aggregation of the children seemed to favor its increase. 3. The propagation of the disease by "personal communication," in other words, the lack of enforcement of isolation after the character of the disease became apparent.

——	Year.	Origin of outbreak.	Cause of propagation.	Sanitary condition.
Alvaston	1888		P. C. (school)	Grave defects.
Barnstaple	1888	Unrecognized cases; mumps at first	P. C.	
Berkhampstead	1888	Sore throat first	P. C. (school)	
Brinkworth	1888	Sore throat first	P. C. (school)	Bad.
Easingwold	1888	Non-fatal throat cases first	P. C.	Bad.
Hastings	1888		P. C. (school)	Not satisfactory.
Stalybridge	1888	Croup, undoubtedly diphtheria	Negative as to p. c	Unsatisfactory.
Tendering	1888	Sore throat and follicular tonsilitis	P. C. (school). Many houses exposed to sewer air.	
Ashbourne	1890	Sore throat first	P. C. (school)	
Aylesbury	1890	Sore throat first	P. C. (school).	Unsatisfactory.
Berwick	1890	Endemic throat ilness		Imperfect.
Camelford	1890	Not ascertained		Negligence.
Dingestow	1890		Apparently spreading by other means than p. c.	
Enfield	1890	P. C. (school)	P. C. (schools, milk, cats)	
Exmouth	1890	Not traced	P. C.	Sewers bad.
Farnham	1890	Obscure	P. C. (school)	Unsatisfactory.
Kilkhampton	1890	Unknown	P. C.	Unsatisfactory.
Llandissilio	1890	Not given	P. C. (dogs)	Unsatisfactory.
Llanndyn	1890	Not ascertained, first cases not recognized.	P. C. (church)	
Midsomer	1890	Perhaps from next parish; sore throat	P. C. (school)	

——	Year.	Origin of outbreak.	Cause of propagation.	Sanitary condition.
Norwich	1890	Uncertain	P. C. (school)	
Queen Cammel	1890		P. C. (school)	Gross unsanitary conditions.
St. Anstel	1890	Sore throat, etc.	P. C. (schools, etc.)	Drain ill trapped.
Walthamstow	1890		P. C. (school)	
Whitford	1890	Perhaps by p. c.	Perhaps by p. c. of unrecognized cases	Grave defects.
Workington	1890	None ascertained	No evidence of infection.	Undrained streets.
New Cansan, Com	1886	Not ascertained.	P. C.	
Bricknock, Pem	1888		P. C.	
Hamburg, Pem	1886	Not ascertained.	P. C.	
Newburgh, N. Y.	1891		P. C.	
New Bethlehem			P. C.	
Mooretown, Ont.	1883		P. C.	
Smith's Falls	1884		P. C.	
Nipissing Dist.	1887		P. C.	
Parry Sound	1889	Infection	P. C.	
North Renfrew	1892	Infection	P. C.	

NOTE.—P. C. indicates "personal communication.

In the years 1887 and 1888 Drs. Elliott and Lehmann, acting as inspectors of the Provincial Board of Health report on epidemics of diphtheria in the district to the north of Muskoka, chiefly along the line of the railroad. In the report of 1887 the disease was shown to be most prevalent in Bracebridge, seven families, ten cases and three deaths; Sundridge, one family, eight cases and two deaths; Powassan, one family, five cases and four deaths, and its cause given as due to personal communication, except in the case of one family at Bracebridge, where the physician, Dr. Howland, expressed himself as "having carried the disease home from a patient." Reports of 1888 confirm its continued progress in and around Powassan, thirty-eight cases, with eleven deaths, and its spread to North Bay and district on the North Shore of Lake Nipissing, in the village of North Bay seven houses, with sixteen cases and four deaths. Early in 1889 the disease was making such progress in the settlements to the west and north-west of Powassan, where the people were almost without medical aid, that Dr. Wade and myself were sent to give that assistance so much needed. The cases were found to be scattered over some six or seven townships of more than three hundred thousand acres in extent. The time was the month of February, the snowfall was heavy, often making travel impossible and the thermometer was low. Many of the settlers were German Poles, some Swiss, with but poor knowledge of English and still less of that quality which is said to be next in order to godliness. The first case appeared early in the fall of 1888, having contracted it from a case at North Bay, where it is mentioned in Dr. Lehmann's report as being epidemic. From that time until my inspection in February there had been one hundred and twenty-two cases in forty families, with forty-nine deaths; 47.5 per cent. of these families were Germans—the greatest mortality being in two of these households, eight cases and six deaths, and seven cases and six deaths. During the six weeks of my inspection there were, in addition to the above, six families attacked with the disease, eighteen cases with six deaths (two infants under one year) and in every household the first case was proven to be due to personal communication. The disease affected both old and young alike, the oldest case being that of a man of sixty, in whom post-diphtheritic paralysis was most marked;

the youngest an infant at the breast. I saw during the epidemic many cases of tonsilitis in a house other than those affected with the disease.

This epidemic undoubtedly owed its origin to the first case at Nipissing village, and a direct history of contagion was obtainable from that out. In the village itself one throat atomizer is perhaps accountable for more cases than any other medium; it was kindly loaned to spray throats generally thinking to prevent the disease. One man was unknowingly the means of affecting some four households as he was journeying into a lumber camp; complaining of a sore throat, not a thought was given as to diphtheria until the disease appeared in the houses and news was obtained of this individual's death.

Most of the cases were without medical aid, being from twenty to fifty miles from the nearest physician. In none of the families was the first precaution taken to prevent those afflicted from mingling with the healthy, its contagiousness not being recognized; indeed, in most cases this would have been an utter impossibility, as the houses of log are of one storey and when partitioned off into rooms it is by means of thin boards reaching part way to the ceiling. Many of the cases, no doubt, sat up as long as possible in close proximity to a large wood stove, on to which they were constantly expectorating. As a result the state of the air of the house can be better imagined than described. In these one-roomed houses bodies of the deceased were kept for days, and upon the occasion of the funeral in this poisoned cabin gathered men, women and children in but a short space of time, frequently to become victims themselves to the subtle demon. It was reported to me that two members of a family returning subsequent to the death of one of their number, the body was disinterred to permit of their viewing it. That "last long lingering look" proved fatal to both. The houses of the settlers were not all that could have been desired as regards their sanitary conditions. At that particular season of the year most of the time is spent in-doors in an overheated atmosphere, receiving but little fresh air, and at both back and front doors arises constantly that peculiar odor from a combination of slops and refuse which is daily distributed for a few feet around. Of the yards I am unable to speak, as a deep mantle of pure snow lay thickly around; but

from what glimpse I was able to obtain in the early spring the impression was not favorable. In the two households wherein happened the largest number of deaths the most opposite sanitary conditions existed. The one was markedly clean both as to internal and external arrangements, whilst the other answered more the description given by Kennan of some of the Siberian homes. In this epidemic neither old nor young, the clean or the dirty, the poor or the better housed and fed seemed insured against the disease; and it was not until a system of quarantine was enforced and isolation insisted upon for from seven to fourteen days after the disappearance of membrane, funerals ordered private, with speedy disposal of the dead and careful disinfection of generally the whole house, and not until these measures had been enforced that the spread of the disease was stopped.

The second epidemic of which I wish to speak happened in the month of October, 1892, diphtheria first appearing in a lumber camp of some thirty or forty men in the township of Niven, North Renfrew, a shantyman having contracted the disease from a fellow-employee, who had suffered from it while at home near Ottawa before leaving for the camp. This man was cook, and either he was himself directly the means of infecting the camp or his clothes contained the contagium. The first case died October 11th at the Basin Depot of the lumber company, whither he had been removed a day or so previous. Two youths from the village of Killaloe contracted the disease at the depot from this case, and, feeling unwell, returned to their homes. One, however, before doing so went on business to the Bark Lake Depot of the same company, township of Jones, remaining over night at an adjoining hotel, subsequently going home.

We thus had four centres of infection, viz.:

(1) The camp. (2) The Basin depot. (3) Hotel near Bark Lake Depot. (4) The homes in the village of Killaloe.

For various reasons there was little to expect of the disease spreading to any outside No. 1 (the camp).

No. 2. "The depot," by reason of its being the distributing point of both men and supplies to some seven other camps in the adjacent woods, it was to be feared would prove a means of its spread.

No. 3 (the hotel) being close to the Bark Lake Depot and a favorite stopping place, also the Post Office, receiving and dispatching mail matter for the lumber company and surrounding settlement, was the centre most to be dreaded.

No. 4. The village was fortunately nearer medical aid, and isolation had been enforced.

Investigation proved that the hotel had been the chief means for propagation of the disease, and the camp only was infected.

In less than four weeks the disease had been carried into some seven townships, amongst a scattered community, seventy-four persons having contracted it, of whom twenty-eight had died ; at the time of my visit, November 9th, thirteen families were found to be infected.

The measures taken in this epidemic were the appointing of sanitary police in each of three districts, the quarantining of the several households, the police purchasing and delivering food and household necessaries, the closing of the hotel and removal of Post Office, and the erection of new barracks at the camp, with the detention in the old shanty of all those attacked with the disease for thirty-five days from the date of onset and the subsequent burning of the building, with, of course, the disinfection of all wearing apparel and bedding, and with a free use of soap and water and solution bichloride of mercury. By the adoption of these measures and personally superintending their fulfilment during the three weeks I was in the district, there is every reason to believe is due the preventing its further spread. The only fresh case was that of a young man at Brudenell, who the greater part of a day was in the company of a person who, within twenty-four hours of his visit to this village, was detained at the hotel, having unmistakable symptoms of diphtheria.

The high mortality in both these epidemics, viz., 40.1 per cent. of the number attacked in Parry Sound, and 37.3 per cent. in North Renfrew, is to be attributed to the following factors, at first to an ignorance of the disease being diphtheria, and to a mingling of the infected and non-infected ; second, the complete absence in many cases

of medical attendance, the nearest doctor being often twenty-five to thirty miles, and in some fifty to sixty miles distant. Many of the families were poorly housed and imperfectly fed. Their surroundings were far from being anything like in a fair sanitary condition as regards both internal and external arrangements. Funerals were public, and bodies exposed to public gaze. There was an entire want of means to isolate cases even if medical attendance was at hand. Log houses of even the best internal construction, as found existing in these districts, afford no chance to isolate, and, further, cases were considered cured and free from the disease at too early a period of convalescence.

At the time of my visit to the Renfrew district the settlers were in a wild state of panic; the healthy isolated themselves, and those found on the roads were principally from infected houses. This order of things was soon reversed, and the sanitary police, after being instructed as to their duties, worked admirably. The presence of the disease in the lumber camp was a matter requiring prompt attention. It was found better to isolate the diseased ones in the old camp and remove the healthy to a new building. The result was most gratifying; not another case appeared among these shanty men.

Experience teaches that epidemics follow by a commingling of the healthy and the diseased, and this being the most frequent cause, the children shown closely commingling at school, and therefore are the greatest sufferers. This "personal communication," often arises from a failure on the part of the medical attendant to take precautions as to isolation of the first cases of so-called sore throat, tonsilitis, etc. If these cases received the care which they ought, we should, I believe, have to chronicle fewer epidemics of this dread disease. Again, this "personal communication" may take place subsequent to the attack of diphtheria at a period when it is supposed to be free from the contagion, the patient retaining perhaps in the sputa the bacillus diphtheriæ, or there still existing a small patch of membrane in a concealed situation. Too often patients are relieved from what seems an irksome quarantine before they are

quite free from infection, and, as a consequence, others are attacked. To state any fixed time when each individual case is recovered and to be allowed intercourse with the others of the household is a question about which we cannot lay down any fixed rule. In this country the only way to meet epidemics of this or any other infectious disease where medical aid is, by reason of distance, almost an impossibility, is that suggested by Dr. Bryce some few years ago, viz., the construction of small isolation hospitals at certain centres, to which cases could be at once removed. If some plan of this kind not adopted in our sparsely scattered districts, there will be a repetition of the story as given of the epidemics in Parry Sound and Renfrew districts; unless immunity has been found in the substance discovered by Dr. Aronson and reported by him to the Berlin Medical Society so recently as May 17th last.

THE SANITARY CONDITION OF FACTORIES.

By Robert Barber, Esq., Toronto, Provincial Inspector of Factories.

Mr. President and Gentlemen,—It is with considerable diffidence that I accepted the suggestion of Dr. Bryce, the secretary of the Provincial Board of Health, to come before this Association with a paper on a subject at all connected with sanitation—a subject with which, from the very nature of your profession, you are required to be familiar; but when I ascertained that I was merely expected to give you an idea on the sanitary condition of factories, as observed in my visits as Inspector, I readily consented. It is not with the expectation that anything I may say will in any way add to your knowledge, but I hope that some of my remarks may be of interest to you.

I may first state that the Factories' Act, in providing for the health of employees, requires that no girls under 14 years of age and no boys under 12 years of age shall be employed in any factory; and that no boy under 14 years of age and no female shall be employed for more than 10 hours a day, nor for more than 60 hours in one week, except for a certain limited period, when overtime may be worked under certain conditions, and only with the approval of the Inspector. Also, all boys between 12 and 14 years of age and all females shall be allowed one hour at noon each day for meals; and that, if the Inspector so directs, no meals shall be eaten in the workrooms while the manufacturing process is there being carried on. If the Inspector so directs, a special room or place shall be provided by the employer for the purpose of eating or dining.

While the foregoing provisions are made in the interest of the health of children and female employees, they cannot all be called strictly sanitary provisions as sanitation is understood by this Association or by health officers in general.

But in addition to the above there are the following provisions:

Every factory shall be kept in a cleanly state and free from effluvia arising from any drain, privy or any other nuisance.

A factory shall not be overcrowded while work is carried on therein as to be injurious to the health of the persons employed therein.

Every factory shall be ventilated in such a manner as to render harmless, so far as is reasonably practicable, all the gases, vapors, dust or other impurities generated in the course of the manufacturing process or handicraft carried on therein that may be injurious to health.

In every factory there shall be kept provided a sufficient number and description of privies, earth or water-closets, and urinals for the employees of such factory; such closets and urinals shall at all times be kept clean and well ventilated, and separate sets thereof shall be provided for the use of male and female employees, and shall have respectively separate approaches.

In every factory where any process is carried on by which dust is generated and inhaled by the workers to any injurious extent, if such inhalation can be by mechanical means prevented or partially prevented, the Inspector may direct that such means shall be provided within a reasonable time by the employer, who in such cases shall be bound so to provide them.

From the foregoing provisions of the Factories' Act it will be seen that the Inspector has to deal with dust, offensive effluvia, vitiated air from overcrowding, gases, vapors, fumes, or other matter injurious to the health of all employees, male and female alike.

Having thus laid before you the duties of the Inspector in regard to the sanitary condition of the factories, I will now proceed to convey to you an idea of the condition of many factories which I visited in the first years of inspection.

I may mention that what are commonly called workshops, are included as factories under the Factories' Act, so long as there are six persons or more employed.

These are for the most part employed in the manufacture of millinery, dresses and clothing.

The most universal impurity in the air where people are assembled in numbers indoors is the natural one of di-oxide of carbon and a

small amount of organic matter, being given off from the lungs and skin.

There is always present in the normal atmosphere about .4 of 1 to 1,000 volumes of carbon di-oxide. When this proportion increases to .6 to 1,000 volumes, with a corresponding increase in the organic matter it then becomes very deleterious to the health of persons remaining in such vitiated air any considerable time.

According to scientists, who have given this subject a careful study, it is not the increased amount of carbon di-oxide that is so dangerous, but the increased proportion of organic matter, the result of respiration, that is present. It is the more dangerous not because of any sudden effect that is felt, but on the contrary, it is slow and insidious, gradually undermining the general tone and vigor of the system, thus leaving it the more liable to the attacks of some of the many diseases always prevalent.

One partial remedy for the condition of the air in working rooms in factories is that the Factories' Act authorizes the Inspector, where he thinks the circumstances warrant it, by there being too many employees in a room, to have provided more cubic space for the occupants.

The British Factories and Workshops' Act of 1878, provides that in workshops, at least 250 cubic feet of space shall be allowed to each person employed during the day and 400 while working at night, thus allowing for the oxygen consumed by gas or oil lights, three gas burners being supposed to consume as much oxygen as one person. It is found that one cubic foot of coal gas destroys the oxygen of eight cubic feet of air, producing two cubic feet of carbon di-oxide besides other impurities.

The Factories' Act of this Province does not fix any cubic space as the proper allowance for each worker; it is left to the Inspector to determine, and he has the privilege of obtaining the opinion, where in doubt, on any sanitary point, of a physician or health officer.

Where in factories, there is much machinery, which occupies considerable space, there is not much possibility of overcrowding

to the extent of reducing the proper allowance of cubic space, taking 250 cubic feet as a standard. So it is only as a rule in workshops, so called, where manual labor only is employed that there is a danger of overcrowding.

Wilson, in his hand-book on Hygiene, after giving the opinions of Drs. Parkes, De Chaumont and others says: "The following may be accepted as the standard conditions necessary for the requirements of perfect health:—

"1. That the limit of maximum impurity of air, vitiated by respiration, ought not to exceed .6 per 1,000 volumes.

"2. That to ensure the maintenance of this standard under ordinary circumstances 3,000 cubic feet of pure air must be supplied per head per hour.

"3. That for this purpose and with ordinary means of ventilation a space of at least 1,000 cubic feet should be allowed per head in buildings permanently occupied."

Now, to supply each worker in 250 cubic feet of space with 3,000 cubic feet of fresh air per hour, it would require the air to be renewed twelve times per hour. This could not be done by natural means, and in many workshops there is no power to propel fans.

Taking 1,000 cubic feet as a proper allowance of space for each worker, the air would be required to be renewed three times per hour. This can easily be done by natural ventilation, but the difficulty is to do it without creating draughts, especially in cold weather. The system of heating now coming into vogue, by propelling air which has first been heated by passing over hot steam pipes, into workrooms, has the advantage of keeping the rooms at a proper temperature, and of the air being constantly renewed without creating draughts. In the mild season of the year the same system can be utilized for supplying fresh cool air, the heating pipes being cold.

In many of the factories, where sewing machines were formerly operated by foot power, the work is now done by electricity, which power can also be made available for ventilation and circulation. This change of power has also another great health advantage to female operators.

I may say that I have not experienced any great difficulty in having the air in the workrooms kept in a fairly healthy condition, but I fear that sometimes between my visits, in the inclement season of the year, to avoid draughts the supply of fresh air is not always as great as one could hope for. I may mention as instances several cigar factories, no machinery, where there was a disposition to overcrowd and a great dislike to fresh air, except in very mild weather.

In these in cold weather, when windows and doors were closed, there was a close fœtid smell in the rooms, mingled with the odor arising from the dampened tobacco leaves, altogether to me, unpleasant, and, I felt sure, unhealthy as well. It was with considerable difficulty that I prevailed on the proprietors or foremen to see to it that there was provided a better condition of things.

Since then nearly all those referred to have removed into new, suitable and commodious premises.

In some laundries where the goods are ironed between hollow rollers, heated by a mixture of gas and air burning within, generally there is an odor of partially consumed gas, pointing to the escape of CO_2 and CO. This generation of CO. can, to a large extent, be controlled by the attendants properly regulating the proportion of gas and air, but in many cases they are very careless in this respect, being ignorant of its effect.

I have had the proprietors introduce exhaust fans for removing the foul air from the rooms in such laundries as I considered the air much below the standard.

In many of the larger laundries the whole process of washing, drying and mangling is done by steam, and in warm weather the escaping steam and heat with that from the wringing machines makes the temperature of the rooms very uncomfortable, as the air would be saturated with moisture from the escaping steam, rendering evaporation of perspiration from the skin of the workers very slow, and consequently causing them to feel the heat all the more.

The exhaust fans serve a good purpose here in removing the impure and heated air.

I have known of several cases of girls fainting from the excessive heat and oppression in laundries in very warm weather, and the temperature inside up to 96°.

Another widespread evil in factories is dust, varying in its nature, vegetable or mineral, according to the industry in which it is generated. It is most common in foundries, woodworking establishments, flax-scutching and spinning mills, cotton, woollen and shoddy factories.

I think I am safe in asserting that foundries have been in the past the most difficult to regulate in this respect. There is that escaping from the rumblers, a machine having a cylinder running horizontally, into which the rough sandy castings are placed as full as it can hold, it is then set revolving and the friction of the castings against each other rubs off the adhering sand, creating a great dust, some of which is heavy and soon falls to the ground, while the lighter remains in suspension and pervades the air in the neighboring rooms.

Some foundries have from two to ten of these rumblers placed in rooms where men are working, and no provision made for the arrest of dust, and the men would work about sixty hours a week in this atmosphere, so full of dust that at times one could see only a few yards off. I am glad to be able to state that this evil can be and is being pretty well conquered now, by means of powerful exhaust fans, properly applied.

In foundries and some other ironworking industries there is a dust created by dry grinding on emery wheels and grindstones.

Also in moulding rooms, in connection with foundries, there is always more or less smoke and carbon di-oxide generated in pouring or filling the moulds with molten iron. This smoke and gas comes principally from the produced charcoal used in facing the moulds, and in some cases from the hay in the cores, being consumed by the molten metal when poured in.

Moulding rooms built nowadays are erected specially for the purpose, providing for proper ventilation, by having plenty of windows and ventilators, easily opened, in the walls and roof.

Some of the foundries were built from 20 to 40 years ago, when peoples' ideas of building were quite different from what prevails to-day, the walls being thick, the ceilings low, windows small and fewer in number; as business increased the original buildings were added to piece by piece as required, and the result is that many of such places are difficult to properly ventilate without great expense. But those foundries built since the Factories' Act became law, in 1884, are very much superior to the older ones in every respect.

Woodworking industries also are very fertile in the production of dust, it being given off from fast-running saws, planers, sand drums, belts and sand papering and other machines.

Fortunately the refuse shavings from these machines can be used as fuel for the generation of steam for power, heating and drying purposes, therefore there is introduced into almost every important and many of the smaller woodworking factories a system of exhaust fan, from which there is a main pipe, having a branch to each machine, connected by a suitable contrivance, to carry away the shavings and dust to the vicinity of the boilers. Not only is the dust prevented from escaping into the rooms, but an indraught of fresh air must follow, to replace that being constantly removed by the fan.

In flax scutching works there is a great quantity of dust put in circulation, from the earth of the fields adhering to the stalks and the roots, which are pulled. It is disturbed by the machinery in removing the seed, and again in the next process of scutching, or breaking the brittle frame of the stalk to remove it from the fibre.

There are no appliances used for the removal of dust in these works, but it is generally carried on in buildings like barns, with plenty of openings for air to come in and dust to go out.

In flax spinning factories there is some dust from the same cause and also short fibres of flax floating in the air. Exhaust fans are used to remedy this as far as possible.

In cotton factories there are in some of the departments short fibres flying in the air, varying in degree, according to circumstances. There is also in the weaving rooms a dust coming from the sizing or dressing, which is chiefly made from starch from flour or potatoes. The quantity of this dust depends on how heavily the warp is dressed and on the preparation of the dressing.

Referring to the effect of this dust from over-sized warps the Commissioners in their "Report on the effects of Heavy Sizing in Cotton Weaving on the Health of the Operators employed," presented to both Houses of the British Parliament, say: "We think that the balance of evidence is in favor of harm resulting, not to strong and vigorous constitutions, but to those that are weakly or that have tendencies to rheumatics or pulmonary disease; and that these form a considerable proportion of the factory population few that know them will be disposed to doubt."

In woollen mills there is noticeable in the principal departments short wool fibres floating in the air, and the same in shoddy mills.

There is no other dust as the unwashed wools have to be freed from yolk and sand before going to the machinery.

In silver and nickel plating works there is a dust thrown off in the buffing process, coming mostly from the polishing powder.

In the manufacture of horn combs there is also a fine dust given off in finishing, and being heated in the process gives off an odour of animal matter.

The foregoing are the principal industries creating dust in my district, and the same principles of applying exhaust fans for its removal will, with certain modifications, apply to all.

Turning now from those visible impurities, to those not so perceptible to the eyes as to the senses of smell and taste, viz., fumes, gases, vapors and odors or effluvia, I will first allude to the fumes given off in the process of electro-plating, principally silver and nickel. When the bath is prepared and is in readiness the electric current is turned on. Then begins decomposition of the solution and strong fumes are given off, which are considered detrimental to health, the most objectionable of which is hydrocyanic acid given off from

decomposition of cyanide of potassium in silver plating, and sometimes in copper plating. I have been told by the manager of one of the largest silver plating works in the Province that the habitual breathing of these fumes has a fattening tendency, similar as in the use of arsenic.

In the larger plating works the process is carried on in a room by itself, provided with suitable natural ventilation or with fans.

In factories where it is necessary to clean iron or wire preparatory to some other process and which is done by applying the metal in a pickle compound of generally sulphuric acid in water, there are fumes given off that are irritating and otherwise unpleasant.

I have noticed no provision to remedy this except in wire covering works, where it is done by open ventilation in the roof.

In the chemical works of London there are the strong fumes from burning sulphur in the manufacture of sulphuric acid, also those of hydro-chloric and nitric acids, as well as ammonia, all of which are very strong and irritating.

The buildings are erected with a view to natural ventilation, and the attendants are not as a rule required to be long at a time exposed to the fumes.

In paper mills, in the engine or beating room there is always a great disengagement of chlorine after the chloride of lime is put in the engines, and also in the department where the colored rags are boiled under pressure in a revolving boiler containing lime and soda. When the process is complete and the boiler is emptied there is an escape of ammonia, which at times is very strong, and in one mill I have noticed that the chlorine from the engine room, coming in contact with the ammonia from the rag boiling room, a chemicial union takes place between the two gases forming hydro-chloric acid, which remains in suspension in the air in the form of vapor, quite visible, where before the union the individual gases were invisible. Still I have not heard from any employed in paper mills that the occupation was unhealthy.

In wood pulp mills, where the wood is treated by the sulphite process, there is an escape more or less strong of sulphurous acid gas,

and such is also the case in fruit evaporating factories, where the sliced apples are subjected to the fumes of burning sulphur for their preservation ; and also in factories making extract, a substitute for shoddy, by treating rags composed of cotton and wool with strong sulphurous fumes at a raised temperature, to destroy the cotton and leave a wool residue. In the three last named industries there is a considerable escape of the strong fumes of sulphur and the persons engaged in these occupations complain very much of the effects. I have done what I could to lessen the evil, but it cannot be wholly done away with.

In some manufactories where much paint is used in finishing their goods, the fumes, at times, of benzine, are very strong, so much so as to disagree with some of the workers, and means are now taken to remedy this by natural ventilation. The same remarks will apply where methylated spirits are used.

There are noxious fumes given off in the melting of zinc, in the manufacture of brass and in galvanizing or covering iron with molten zinc. These for the most part pass up the chimney or escape by the roof ventilators.

Many smaller factories in cold weather are heated by stoves, many burning anthracite coal. The stoves and pipes are leaky, and there is an escape more or less of carbon and sulphur gases.

Carbonic acid gas is largely given off in the process of fermentation in breweries and distilleries. There are instances of persons being overcome by the large proportion of this gas by going into the fermenting room without airing it after it had been closed for a time, while the process of fermentation was going on.

I have met in my experiences as Inspector many different odors some of which were pleasant, and many the reverse, very much so. Amongst the former I may mention the different essential oils used for flavoring confectionery, soaps, essences and perfumes ; fumes from the gums in the manufacture of varnishes, tar, and sealing wax in brush works, red cedar in coffin and organ-reed factories, fragrance of birch or in Russia leather used in bookbinding and the manufacture of pocket-books, shellac on felt hat and other works, printing

ink, camphor where celluloid is used in the manufacture of fancy goods, collars and cuffs, piano keys and billiard balls ; coffee, chocolate, spices, burnt peas and beans for adulterating spices, that of burnt parsnips for adulterating chiccory, as well as a host of others. I do not understand that any of these can be considered as deleterious

The essential oils themselves in contact are antiseptic as has been made known through the famous compound listerine ; and the fumes from oils and the resins or gums are known to be soothing to throat and chest troubles—*vide* treatment in phthisis, whooping cough and diphtheria, and some physicians long ago were accustomed to send their consumptive patients to the woods of North Carolina, where turpentine and resin were manufactured, to inhale the fumes, and I can add my own testimony to the grateful soothing influence I experienced in visiting varnish works and inhaling the fumes. An interesting part in this connection is related in the last report of H. M. Chief Inspector of Factories and Workshops of Britain, to the effect that in two weaving sheds employing 460 persons where steam was sprayed into the rooms to keep the moisture in the air above the average degree, as is common in cotton weaving rooms, a preparation of eucalyptus is used in the steam boilers to prevent scale, and though influenza was then prevalent there was not a single case of it among the weavers. But, gentlemen, I fear I am treading on dangerous ground in encroaching on your domain, therefore I will withdraw and proceed with my story. Among those odors I encounter, not so savory as the foregoing and some of them offensive and disgusting are the cadaverous ones of glue in many woodworking, paper box and other factories, works manufacturing glue, in wall paper factories where it is used for fixing the colors and sometimes stands a long time before it is used after being prepared. There is that of decomposing tallow in soap and candle works and in fertilizing works, which are the receptacle for all that is unutterably disgusting. Stinking bones, stinking meat, entrails, horns, hoofs, everything animal that no other use can be found for, goes there, and in warm weather the raw material does not improve with age. On one occasion the stench from one of these works pursued me for nearly two miles, the wind

being with me. Then, sometimes in pork packing and lard rendering concerns, there is an unpleasant odor, for you have no idea how little goes to waste in this business nowadays and if you knew all you would use none but the best lard in your households.

Then there is the odor arising from tempering steel by throwing it whitehot into fish oil, an odor I am not at all partial to, being too suggestive of cod's liver.

There is the musty woollen smell from web heating flocks in the finishing rooms of some woollen mills, the disagreeable one of hides being removed from lime vats in tanneries, hot suds in laundries, that of tobacco in the process of sweating in tobacco factories, benzine where painting is done, mephitic and other animal odors in furriers' workshops, and the most universal the effluvia from urinals and closets in various degrees of strength and unpleasantness. In my first years of inspection these were a very common evil, and constantly recurring in many factories, but now, particularly in the larger establishments, they receive regular attention from the employers, and as a rule are as little offensive as practicable. As to closets in cities, it is not often they are offensive when kept in repair, where they are connected with the city sewers and having a plentiful supply of flushing water, but where the vault or pit is in use I find that the Local Boards of Health throughout my district, in the smaller places as well as cities, are looking well after these.

A few years ago I found that fruit and vegetable canning factories had not given sanitation much consideration, allowing their refuse to accumulate in the yard, where it was for any person who wished to take away, as is generally done for pig feed. It would lie for days fermenting in the hot sun, and rain would wash through it, spreading the decomposing organic matter over the yard, disgusting to the eye and offensive to the nose. The washings of the floors of the factories would drain through to the ground below to rot there, while from 50 to 150 persons, chiefly children and females, were working over the decaying sludge, which was a menace to health. Wherever I found these conditions to exist I at once ordered remedies, such as the removal of the refuse and a plentiful sprinkling of

copperas solution. And to-day the canneries have drains to carry off their washings, and the refuse peelings, pods, cobs, hulls, pits and tomato skins are removed daily. Many of the canneries are now as clean as a kitchen, and none need hesitate to use their goods.

In many industries where barrels of water are kept handy for extinguishing incipient fires I have found in some cases the water in the barrels was putrid and foul smelling. These I asked to have emptied and refilled, adding salt or some antiseptic, and to cover the barrels, to keep out dust, which in some industries was of a nature to corrupt the water.

In a few factories where glue was used in large quantities, in one portion of the room only, there was an accumulation of splattered glue on the floor, varying from $\frac{1}{4}$ to $1\frac{1}{2}$ inches in thickness. This in a moist atmosphere gave off a very foul smell, which was remedied by the frequent sprinkling of the gluey floor with a strong solution of common salt.

In many dye-houses in cold weather the steam escaping from the vats condenses in the form of vapor as it leaves the hot liquid, causing a fog, more or less dense, according to the external temperature in which the workers pursue their duties all day long, the colder the weather the more dense the fog. I have not understood that any evil result followed this condition to persons of ordinary health, beyond a tendency to take cold from exposure in damp clothing when leaving work. Some dye-houses of late years have been equipped with one or more fans to exhaust the vapory atmosphere. These are very efficient for the purpose if properly applied and of sufficient speed and capacity. Some instead have hot air blown into them, thus keeping up the temperature above condensation point, which is easily done, as the constant influx of hot air forces out a corresponding volume of the saturated air. Neither of these systems are very general as yet. To rid dye-houses of vapor in winter has long been a difficult problem among dyers, though it is now solved, but cannot be done without considerable financial outlay, which is likely to retard its rapid adoption.

In referring to the many different impurities in the air of factories and its sanitary condition generally, I do not wish it to be inferred that such conditions were universal, for there were many exceptions where the best of sanitary conditions existed, where the workrooms were ample—no overcrowding—well lighted, heated and ventilated, walls and ceilings lime-washed frequently, closets and urinals were kept clean and free from odor. Many of these factories which in the early years of inspection were not in proper condition for the sanitary welfare of the workers have since been made so, and many others much improved ; but occasionally I find that very little in the way of improvements can be done, owing to the building being old-fashioned and of inconvenient construction. It is always a joy to me when I learn that one of such places is to be vacated for one more modern.

I must not omit to mention that when our legislators have done so much for the public health, and especially that of factory workers, the employees themselves do not in all cases do their share in regard to the sanitary condition of places of labor. There are employees who must of necessity work at occupations where dust is given off in great quantities, which cannot all be disposed of by fans ; these men should wear respirators. Occasionally I notice one in use, but as a rule they are disliked and are rather inconvenient for those who chew tobacco. Again, on many occasions proprietors have complained to me of the gross carelessness, and often mischief, on the part of some of their employees in wilfully placing obstructions in the closets which stop them up, causing filth, inconvenience and expense in again opening up drains, or cleaning out pipes. This is not an uncommon cause of complaint among employers in cities where closets are connected with the sewers.

The foregoing is a brief review of the more important impurities n the air of factories I have encountered, and, in conclusion, I wish to say that one cannot consider the sanitary condition of factories without giving a thought to the health of the operatives. It is the opinion of many physicians in Britain having an extensive practice among factory operatives, that outside of certain industries,

which are known undoubtedly to be injurious to health from their very nature, a great deal of the ilness of operatives is not so much from the unfavorable condition of their employment as from inherited weakly constitutions, poor diet and unsanitary surroundings when at home. The struggle for existence may in generations to come remove the first cause, philanthropy and science the last, but the question of poor diet is one of wages and is largely in their own hands at the present day.

Intemperance and vicious excesses are the causes of a great deal of suffering, which unfortunately does not end with the first victim but is often transmitted to succeeding generations. I regret to say that I see but little hope of lessening these evils, and the question sometimes presents itself to me, Is not physical weakness often the cause of intemperance? I believe it is.

INSPECTION OF CHEESE FACTORIES.

By E. E. Kitchen, Esq., M.D., St. George: Member Provincial Board of Health.

Mr. President and Gentlemen,—There is no more vital matter to the citizen of this country to-day, not only from a sanitary point of view, but from a financial point as well, than the important branch of agriculture—cheese-making. When we consider that it is now nearly a half century since the first cheese factory was established in this Province and that so well informed a cheese man as Mr. McPherson says : "that the quality of milk is not as good as it was ten years ago and there is less of it received from the cow," it behooves us to ask the cause. During the past year there was exported no less than $9,600,000 worth of cheese, and when to this is added the large amount used in home consumption and the vast quantities of milk used in other ways, it may easily be perceived how a slight improvement in the quality and quantity of this article will very materially add to the wealth and comfort of the nation. It is therefore deemed advisable to devote a portion of this paper to the important subject of milk before entering upon the waste product of the factory. *Milk as it comes* to the dairy is composed of substances, partly in solution and partly in suspension. It might be spoken of as a thin emulsion of fat in a watery solution of albuminous matter, sugar and mineral substances In its normal state and from a healthy cow, it has a tendency to acidity. Even before lactic acid is developed it will change litmus paper. Shortly after it is drawn carbonic acid is generated if left warm, but agitation and aeration soon removes it. The development of lactic acid is the true cause of its becoming sour. From the quantity of solid matter other than fat, its weight is much higher than water, in fact its specific gravity varies from 1,029 to 1,035 when its temperature is at 60 F. On the other hand, the fat lessens its specific gravity, being lighter than water. The average milk has about the following composition in 100 parts :

Water	87.00	Albumen	.75
Fat	3.75	Sugar	4.00
Casein	3.80	Ash	.70

It will be seen by this table that there is in every 100 lbs. of milk of the average goodness, 87 lbs. of water and 13 lbs. of solids and fat. From the purely dairy standpoint it has been estimated that if the butter-fat is valued at 16 cents per lb., solids other than fat are worth 2½ cents per lb. Butter fat is the most variable constituent of milk. It has been estimated that this rises from a ½ per cent. in the first milking to 2 per cent. in the middle milking, and to 8 per cent. in the stripping. The Society of Public Analysts of England has adopted as its standard for pure milk 3 per cent. butter-fat and 8.5 per cent. of other solids. France, 4 per cent. butter-fat and 9 per cent. of other solids. New York, 3 per cent. butter-fat and 9 per cent. other solids, while the chief analyst for Canada has recommended a standard of 3.5 per cent. of butter-fat and 8.5 per cent. of other solids.

From a bulletin published by the Internal Revenue Department, it seems that in the cities of the Dominion the amount of butter fat in milk for consumption varies in the highest amount of fat from 4.18 in Quebec to 5.40 in Halifax, while the lowest per cent., 3.62, of fat is highest in Ottawa and lowest, 2.52, in Toronto. Here we have milk being sold varying in butter-fat from 2.52 to 5.40. Is this fair to the vendor of good, rich milk? By placing more water in his article and making it show 2.52 per cent. of butter-fat, he is giving just as much for his money as the lesser percentage. The bulletin goes on to say: "The fact remains that the richest samples might be diluted with an equal amount of water and still be as good as far as regards butter-fat as some of the inferior sorts of genuine milk; watering even to a slight degree may be readily detected and, under the present laws, punished. This may also be accomplished when milk is skimmed, but it does not seem fair that the dairyman who mixes, say 50 per cent. skim milk with whole milk of 4.5 per cent., thus reducing it to 3.2 per cent. of butter-fat, should be punished, while the man who keeps poor animals, feeds them insufficiently, and sells milk containing only 2.75 per cent. of butter-fat which may be legally genuine, should be allowed to escape. Mr. Bell, of the Dairy School at Tavistock, has made a very interesting

experiment in the line of milk, poor in butter-fat and solids and rich in these articles. He selected the milk from 500 cows of the patrons, who, to his knowledge, supplied the poorest milk, and placed it in a small vat. Then he selected milk from 500 cows of those whom he knew by actual experience sent in the best milk, and put this in another small vat. He then tested the two vats and found that containing the poorer milk shewed 3.40 per cent. and the other 4.10 per cent. The vats were then set and, when ready, treated in every respect as nearly alike as possible. They were then put in the curing-room and weighed. This was repeated in two weeks and again in one month, once more at the end of two months. The cheese made from the 3.40 per cent. milk weighed 48 lbs., while that made from the 4.10 per cent. milk weighed 56¼ lbs., the shrinkage of both lots was the same, about three lbs.—the increase in the weight of cheese is scarcely in proportion to the increase in weight of per cent. of fat, but it is so nearly equal that it would only be necessary to sell the cheese made from the richer milk at 3-10 of a cent more per lb. to make the price of fat equal in both cases, and this could readily be done, owing to the superior quality of the cheese made from the richer milk. Surely this is enough to convince us that it is absurd and unfair for dairymen to give the same price for milk to each of their patrons; it would be equally wise for the grain merchant to give each seller of wheat or other grain the same price, instead of grading it and paying the higher price for the best sample.

Since the introduction of the Babcock tester, and it has now been used long enough to know that it is truthful and satisfactory, this selling of milk for its real value may be consummated. *By the use of these testers the worthy farmer* who has carefully selected his cows for the production of the best milk, and feeds and cares for them accordingly, will be rewarded for his labors, while the slovenly and careless man will soon see that it will pay him much better to use the care and thought of his neighbor, and go and do likewise; while the buyer will then know what he is buying, and he, too, will be the gainer.

I wish now to refer to contamination of the milk by disease of the animal which produces it. This is more difficult to reach, from a practical standpoint, than that of being able to tell the richness of milk. When we know that the cow is subject to infectious diseases, such as tuberculosis, cancer, actinomycosis, cattle plague, Texas fever, scarlatina, parturient septicæmia, pyemia, septic mammitis, diphtheria, glanders, rabies, foot-and-mouth disease, pleuro-pneumonia, is it a wonder that the milk should be infected and should be carefully watched?

That disease may be conveyed through milk is acknowledged by scientists. Only last summer, in examining into the cause of anthrax, it was plainly shown that the disease was contracted by cattle feeding on bottom lands which became overflooded in the spring, leaving on their surface the contagion, which came from a tannery up the stream that tanned imported hides infected with the disease. In evidence it was stated that milk from these infected cows when given to pigs caused their death.

But the disease which, *par excellence*, will give the greatest trouble is tuberculosis. Our statistics show that this disease causes 1-7 of all the deaths of the human family; that it is greatly increasing from year to year the general pratitioner knows but too well, and that it is very generally disseminated on this continent, is also too true to be gainsaid. Until recent years it prevailed but little amongst the cattle on this side of the water.

That the large importation of cattle for stock purposes that have been improved by *in and in breeding* is followed by an increased number of cattle affected by this disease, is as well a matter of fact. Bitter affirms that, while statistics are not extant, he has reason to believe 10 per cent. of dairy cows of cities and their environs are affected. From the fact of healthier food, purer air and better surroundings, the percentage may not be so high through the country, still it is known to every veterinarian who has been in practice for a number of years that a large number of cattle die of tuberculosis; that this number is larger in proportion than the increase in the number of cattle. Dr. Stone and other experimenters have shown

without doubt, that the milk of tuberculised animals injected into rabbits and others of the lower order, will cause that disease in those animals, while Prof. Brown remarks that not only the tubercular deposit in meat in its raw state, but flesh from which the tubercular deposit has been trimmed off, will cause the disease in the animal which eats it. The matter of the flesh being made innocuous by roasting by heat and the temperature required for that purpose has got to be tested by experience. We are informed by Prof. Koch that tubercular nodules in the udder of a cow will directly transmit the bacilli of tuberculosis to the milk. The seriousness of this matter will be recognized when we learn that out of 660 cows as shown by German statistics, no less than 37 had tubercular mammitis.

How far milk from tuberculous cows, with no tuberculous nodules in the udder, is tuberculous, is a question of even greater importance, than whether or not flesh with no tubercles is capable of transmitting the disease. But the practical part for us is to know how to tell that a cow has or has not tuberculosis while living, and thus avoid the use of her milk. Although the clinical symptoms will lead the diagnostician to be on his guard for a case of tuberculosis and these symptoms have been well known for a number of years, still it has been left for the close of the 19th century to give us the method of truly diagnosing a case of bovine tuberculosis.

In 1890 Prof. Koch, in his researches for a remedial agent in this disease, discovered tuberculin, which, although as a curative power has proved useless, as a diagnostic agent is likely to prove useful in the cow. Mr. J. J. McKenzie, M.A., who has charge of the laboratory of the Provincial Board of Health, has been making many trials with tuberculin, and has found that the reaction set up in consumptive patients by its injection by Prof. Koch, is also noticed when injected in tuberculised cows. By his extensive experiments during the past year he is now convinced that we have a diagnostic agent upon which the utmost reliance can be placed. He, in conjunction with Dr. Reed, of the Ontario Agricultural College, performed the operation of injection of tuberculin in two imported Guernsey cows,

a few weeks since. The temperature of the first was 100° 4-5 before the operation, while the second was 99° 4-5. They were operated on at 6 45 a. m., on April 22nd. In one hour the temperature had risen one degree. This elevation continued until at 9 p. m., when the first cow registered 104° 4-5, while the second ran up to 107°. Three days after operation a *post mortem* revealed large quantities of tubercular deposits. A peculiar feature was that the first cow had a calf a few weeks old, which, on being killed, was found in a similar unhealthy condition. As tuberculin has now become much cheaper and the operation is simple, why not introduce it generally ? If the Government would appoint an inspector and a few operators for the Province, what great benefit would in a few years be attained. The cows now diseased could be destroyed and those being bought and imported could be tested, and thus only the healthy ones kept. Thus it would not need much flight of imagination to see the day when this dread disease amongst cattle would be of the past, and one important factor in its spread in the human family forever allayed. *Still, after securing milkers free from disease*, well selected and cared for so that milk rich in butter-fat is given, a large amount of care is necessary in order to get a good article in good condition into the vats. This part may be summed up in the word, *cleanliness*. The cows not only need large, airy, warm and well ventilated stables, good, ripe and wholesome food, plenty of salt, but the purest of drinking water. Although these directions have been oft repeated, yet it is a sad fact that but little attention is paid to them. How often has it been told and re-told, that the cow, her udder and teats, should be kept clean, the milker's hands equally so, the pails and receptacles of all kinds washed with water and soda and scalded ; yet dairymen complain of unclean milk, even large lumps of filth finding their way into the milk-can. So soon as the milk is taken from the cow it should be strained and aerated and cooled to from 60 to 70 F. I fear that this aeration is very little done and less understood. It is not necessary to have a machine for the purpose, but any method by which you can get an increased amount of air in the milk. This may be done by stirring, pouring from can to can,

or trickling it over an exposed surface. Aeration is very necessary, for by it you are able to get rid of all the volatile matter and thus clear it of those stable odors so often found in milk. The germs of fermentation which are found in milk may be got rid of by aeration, as it is a peculiar fact that these microbes do not thrive in the presence of oxygen. If you leave the warm, new milk quiet in a closed can, carbonic acid is generated, and then you have the best condition in which these microscopic creatures may thrive; these once started will go on with their decomposing work, even if oxygen is fairly well supplied. It is well known by the cheese makers that such milk has lost a great portion of its coagulating power and thus the cheese will not keep so well. Well airing the milk is said to bring about the acid condition without producing acid. Prof. Robertson says that "neglect of aeration will increase the quantity of milk required to make a pound of fine cheese." Milk that has been carefully looked after should be placed in perfectly clean cans that have been well scalded and aired, and driven to the factory in clean spring wagons. The covers of the cans should be so fastened that the milk will not be churned on its way. It is not my purpose to follow it through the process of being converted into cheese, for during all this time the same *cleanliness* should be observed; but will hasten on to the important *by-product whey*. If this can be fed in a fresh, sweet condition, it becomes an important food. The following is its composition:

	Per cent.		Per cent.
Water	93.00	Milk sugar	4.25
Nitrogenous substance	1.00	Lactic acid	.50
Fat	.50	Ash	.75
			100.00%

Agricultural scientists tell us that this is an important hog food, and that 7 lbs. in every hundred is used to advantage by this animal. They tell us that 100 lbs. of good whey will add 2 lbs. to the live weight of a hog; surely this by-product of the factory should be more intelligently used than it is. I am informed by Mr. J. W. Wheaton, B.A., Secretary of the Dairymen's Association of Western Ontario,

that the larger number of factories in the southern portion of Western Ontario return the whey in the cans to their patrons, while the larger number of factories in the northern portion do not allow it to be returned, but sell it and have it fed to the pigs near the factories. I am not far astray in saying that one-half of the factories in this country to-day are returning the whey to customers in cans. Why is this? Many of the farmers are not alive to the fact that whey is changed very soon, so that its feeding properties are worse than useless, but look upon the dairymen who allow them their whey with great favor, while the dairyman, to secure the amount of milk which he wants for manufacture, uses this as an inducement in order to gain patronage. It is now generally conceded that whey becomes so soon changed and so charged with lactic acid that the tin on the inside of the cans becomes corroded, leaving the iron surface exposed, and this forms a large adjunct in making cheese impure; to say nothing of the lax way of washing the cans, and often only with pond or creek water, and then only by warming it slightly or not at all. It is now conceded that by keeping the distributing vat clean, placing the whey in it while sweet, covering the vat and letting in steam, by so doing the whey becomes sterilized and more fitted to be used as a food. But no doubt the better way are the two following methods:

1st. Have the factory built on an elevation and removed as far as possible from habitable dwellings. Let the whey be forced into a vat above the ground by a jet pump and there sterilized. Now have the vat connected with a properly constructed piggery, and the whey fed there. By a plentiful supply of water the pen could be often cleaned and the solid and liquid contents run off into a large cesspool. This cesspool should be built and plastered with cement. Attached to this should be a smaller one similarly built, but not more than a couple of feet deep and connected with the larger by a syphon. Thus as the solid portion falls to the bottom, the liquid is drawn off and distributed by means of weeping tile to as much of the surrounding land as is needed, and thus acts as a constant fertilizer to growing crops. The solid portion can be mixed with earth and drawn to fields where it is required.

2nd. Have pipes leading from the vat referred to above, to several small enclosures where the pigs can remain in rotation. When field number one gets a fair share of manuring and is likely to become unsanitary, remove them to the adjoining enclosure, and the first one can be plowed and sown with corn, etc. This can be changed as often as necessary.

Neither of these methods can be said to incur large expense. Greater value will be thus secured for the whey and proper use made of the manure; as it is now in connection with a very large portion of factories the whey is lost, the cheese frequently suffers and the pig pens make the whole factory and surroundings an intolerable nuisance, lessening the price of cheese, causing disease, and making living anything but comfortable to those who have the misfortune to live near. *The inspectors of factories* have done much towards the improvement of matters appertaining to the dairying industry, but as the inspection is only to be had by applying for it, and paying for it, only those who are desirous and determined to conduct a good factory apply for it. If it were made compulsory that all cheese factories should be visited at varied intervals, the amount necessary to be paid for the visit would be small in comparison with the large benefits derived.

Thus with cows selected for good health, rich milk, fed and treated well, the milk handled with every care to cleanliness, the cheese made by an intelligent maker, and only first class; the whey sterilized and fed to hogs in a piggery properly cleansed or in small enclosures, the country would in time become far richer and healthier, and contentment and happiness, those handmaidens to wealth and prosperity, would gladden every farmer's home.

SANITARY NEEDS OF THE FARM.

By D. McCrae, Esq., Guelph, Chairman Local Board of Health, Guelph Township.

Mr. President and Gentlemen,—The subject is a large one and two points seem to be enough to touch upon at present, viz. : Pure air and pure water.

Air is the prime necessity of life, and pure air is essential to a healthy life. We are blessed with abundance of pure air on our fields; we do not always get the best of it in our farm homes. The position of the dwelling has much to do with the quality of the air it contains, and therefore with its healthfulness; high, dry situations are the best. This section of country, with its rolling surface, gravel knolls and sandy ridges, has many good sites. Dry, permeable gravels and sands with gently drained slopes, are the best sites for the country home. Low situations on damp soils aggravate lung diseases and are especially bad for consumptives.

About one-third of some soils is air. All soils have more or less. This soil air is frequently drawn into the the dwelling, especially in winter, when the house air is heated. It then rises through the cellar or basement. Purity of cellar air lies at the foundation of purity of house air. The cellar floor should be made air-tight with cement or concrete. The walls should also have a damp proof course above the ground level. If this is not done, the water will rise in the wall, make the house more or less damp and tend to the growth of low forms of vegetable life. The house floors should be made and kept as air-tight as possible to prevent this foul air rising into the house. Where this can not be done perfectly, great care must be taken to keep the cellar air as pure as possible. Our country cellars are so frequently used for the storage of fruits, vegetables and roots, that it requires much care and attention to keep them sweet and pure. Good ventilation is needed to keep the air of the house pure. Windows, many and of good size, frequently opened, are good. Small, dark bedrooms with closed windows are bad. How often, in the

country, we see good dwellings rendered unfit for healthy houses by close shutters or dark blinds. Windows should let in the sunlight. Dark air becomes foul. Sunlight is one of the best germ killers, one of the best disinfectants known. Sunlight for full health is as necessary as air. If trees shade the dwelling and keep out the sunlight, they are out of place. Let in the sunlight winter and summer, and you will have purer air and healthier homes.

Pure water is the second sanitary need, and one much neglected. We dwell in a well-watered land, and much of our soil is a natural filter. We should have pure water, and the one reason we have it not is our own carelessness. The farm well is usually near the house; often between the house and barn; sometimes near the manure pile, and seldom above suspicion of drawing part of the supply from the refuse of the house or barn.

The water in the soil is a very important matter from a sanitary point of view. At varying distances from the surface there is a great lake of ground water. This water will vary in height according to the season and the rainfall. At times it may be near the surface, at others far below and divided into small basins by ridges of hard pan or clay. The lowering of the water will cause air to be drawn deeper into the soil. The rising of the water will force out the air which may be more or less impure. Thus air and water act and re-act upon each other. When too near the surface, the ground water will make an unhealthy site. Five feet would be a bad, fifteen, a good site for a dwelling. Violent fluctuations are bad—worse than a high ground level. A moderately low steady level is the best. This will be secured if the lake be large. It is difficult to say whether or not there is much movement in this underground water. It is evident that into this source, whence comes our well water, is washed the refuse thrown from our dwellings. This brings us to one of the most important and most difficult of questions, viz.: The removal and disposal of house refuse. The farmer seldom pays much attention to these matters. Frequently, the ordinary kitchen slops are thrown on the surface near the dwelling. If there be plant growth sufficient to take up the refuse it will be harmless, but if not,

it will pollute the ground, become offensive and be washed into the well water. If it be some distance to the water, and a good filtering substance, it may not do much harm for some time, but the contrary is the probability. If put into the privy vault it will be so much nearer the water level and will reach it more quickly. These cess-pits are the great source of the pollution of our water supply. They are dangerous anywhere. They should be cleaned out and filled with clean soil. The only safe way is to keep the excreta on the surface and use it as a fertilizer for crops. If plenty of dry earth be used, it will not be offensive, and if frequently removed, it is a valuable manure. When it is left to decompose, much of the value is lost. Dry earth is easily got in summer; when not available ashes will do very well. Wood ashes are the best, but coal ashes will answer the purpose but are not such a valuable manure. The kitchen slops and suds are also difficult to deal with. If daily removed to the manure pile they would make good compost when mixed with the manure. The main principle is that all this refuse should be immediately removed from the house and its neighborhood and, as soon as may be, put upon the soil where it can be utilized as plant food.

On some farms the well may be near the barn and the manure pile. In any case the manure heap should have a tight clay bottom to prevent drainage and save the most valuable parts of the manure. It is not pleasant to think that we may be using manure sewage mixed with our drinking water even when we are assured that it frequently improves the taste. I have yet to learn that there is any such danger to human health from this source as comes from the cess-pit, which is everywhere and always dangerous.

These points attended to, the most urgent sanitary needs of the farm will be put right and the great boon secured, of purer air and purer water.

PURE WATER ON THE FARM.

By Frank T. Shutt, M.A., F.I.C., F.C.S., Ottawa, Chief Chemist, Dominion Experimental Farm.

Mr. President and Gentlemen,—The instruction of the masses—and by the masses I mean the great mass of the people, and not any particular class—in scientific truths, marks, to my mind, one of the greatest and grandest features of the education of our times. Certainly, one of the most pleasing and useful features of our provincial educational system is that it provides for the inculcation of the principles of hygiene, the instilling into the minds of our children of the outlines of sanitary science.

Our Government in so ordering has done wisely, recognizing that knowledge in these matters must result in a healthy people, and that a healthy people is a happy, contented and prosperous people. We feel confident that the good seed now sown must bear good fruit, that this dissemination of hygienic truths must assuredly be followed by our people obeying more and more those laws that regulate health, and the breaking of which leads—as we may easily learn from history—to disease and death.

But the present as well as the future is being paid attention to. It is due to the efforts of the medical profession and scientific men—efforts ably assisted by the press—that the more intelligent and enlightened of our people have learnt of late years so much in matters pertaining to sanitary science. The interest now evinced in this subject is an active and widespread one, and we find on all sides a desire for information on the all-important subject of health preservation.

Though cure is the special work of the physician, prevention, I take it, is the key-note—the prime doctrine of this Association. To make known the paramount importance of pure air, good water and healthful environments, and the danger to health that always accompanies the violation of sanitary laws are, I feel sure, among its principal objects. It is for this reason that I have selected the subject of my address to-day, trusting that from you I may receive valuable aid in impressing upon our rural population—both in the

villages and on the farms—the serious menace to health there is in using impure water, and also in informing them of the common causes of pollution and how they may be avoided.

Our climate is an exceedingly healthful one, our air and natural waters of the purest. It is only by disregarding well known and well proved laws—either through ignorance or wilful negligence—that we breathe impure air or drink polluted water.

It is altogether unnecessary for me here to speak at any length of the relation of drinking water to disease. It is now no longer a matter of conjecture that many diseases may be and are communicated through the water supply. We have ample scientific data to prove beyond doubt that the zymotic diseases—diseases caused by those microscopic plants, bacteria, and more commonly known as germs—*e.g.*, tuberculosis, diphtheria, typhoid fever and cholera, are often spread and rendered epidemic by means of contaminated water, *i.e.*, water receiving and polluted by the excreta and dejecta of patients suffering from these diseases. It is not my purpose here to cite instances to corroborate this statement, since I have no doubt we are all agreed upon its correctness. To verify it, outside of the assistance which bacteriology gives, often falls within the experience of the medical practitioner. The chief impurities found in drinking water, as detected by chemical analysis, are of an organic nature. According to its origin, this organic matter is classified as animal or vegetable. The former is due to the presence of solid and fluid excreta of animals and decaying animal matter; vegetable pollution consists of peaty matter—the more or less decomposed remains of plants. Of this latter class of contamination I have here very little to say. It is a contamination that may be termed natural as against the artificial pollution, of which I wish to speak more particularly to-day. It arises from the circumstance of the river from which the supply is taken passing through a swampy and low-lying district whose rocks are gneissoid in character. Such water, as a rule, is of a deep brown color, very soft and poor in lime salts. Again, it often happens that in certain parts of our lakes where the current is not marked vegetation grows very rapidly during the hot months of summer. Here the water becomes highly charged with decaying plant products, and must be considered more or less dangerous. It is quite true that decaying vegetable matter

is not so injurious as that of animal origin, yet I am of the opinion that in excessive amounts it is very apt to cause diarrhœa and kindred complaints. For this and other reasons which I shall refer to shortly, the drinking by man or beast of water direct and undiluted from the swamp, of water from the shallow and weedy lagoon and from the stagnant pool of surface water, is to be strongly deprecated.

The exact physiological effects of decaying organic matter, *per se* when such is present in a drinking water, are a subject still open for discussion. Sanitarians, however, are agreed as to the truth of the statement that water highly charged with such is dangerous to health, and that decaying animal matter is much more deleterious than that of vegetable origin. The most wholesome waters are those of extreme organic purity. It is not only possible, but probable, that toxic compounds are formed from the decomposing organic matter in a water by what may be called true chemical action, and apart from those that may be produced through the agency of bacteria.

From our present knowledge in organic chemistry we can readily imagine that by changes in the position of the atoms in the molecule may be induced that result in the formation of bodies possessing an altogether different physical and physiological character to the parent substance. This becomes all the more probable in the case of animal matter whichis richin nitrogen, and is therefore peculiarly susceptible to decomposition. The poisonous qualities of many ptomaines or cadaveric alkaloids formed in this way is well known. Future bacteriological work may prove that these result from the life functions of certain specific germs, but so far they appear to rise spontaneously under certain circumstances from the decomposition of the albuminoids.

Whether directly or indirectly, however, great danger to health exists where a water contains animal organic matter, and especially when this is in the form of excremental material. For of this we are no longer in doubt, that such matter is the very best pabulum for the growth and development of disease germs should they find their way into a water. If in addition to this organic filth there is a favorable temperature, all the conditions are present for the rapid multiplication of the germs, and that in a medium peculiarly adapted for the spread of their dire results.

Having now briefly stated what we have to fear from impure and polluted water in the spread of well recognized zymotic diseases, which often assume the proportion of an epidemic, I wish to draw your attention to what I may term the insidious action upon health of such water as I have just referred to—a property of bad water that I fear is often overlooked, and especially so in the country. Water containing drainage from the privy and barn-yard is unwholesome, and there can be little doubt is often the cause of many intestinal disorders, *e.g.*, diarrhœa and indigestion in one or other of its forms. In many instances within my own experience, the analysis of the well water of country families so afflicted has proved conclusively contamination of this character. Although we, fortunately or unfortunately, to a certain extent can habituate ourselves to morbid conditions, and in spite of the fact that the animal system is naturally inimical to the inroads of disease, there must result as a consequence upon the constant use of polluted water an impaired state of health. The bodily vigor is thereby lessened and the way made easy for the attacks of specific disease.

These are facts that we wish to impress very forcibly upon the minds of our people, and more particularly of our rural population. I make no invidious comparison between the intelligence of the farmers and villagers and the inhabitants of towns and cities, but I feel sure it must be largely due to ignorance that so many of the former class use for themselves and their animals water which no analyst would hesitate to condemn as being entirely unfit for drinking purposes, and which from the location of the well and the character of its environments must have become contaminated from polluting sources such as I have mentioned.

In cities and towns the inhabitants use from one common supply, whose purity is or should be well looked after by a properly constituted authority, assisted by expert chemical aid Individual attention and precaution cannot be employed, even when such are necessary. In the country there exists quite a different condition of affairs. Every man in a sense makes his own water supply, and he alone is responsible for the keeping of it pure. We see, therefore, the greater need for education on this vital subject in rural parts than in the cities and towns.

In the country undoubtedly natural conditions prevail by which the inhabitants should have and enjoy the purest of air and water, and yet I make the statement, based on considerable experience, and without fear of contradiction, that in these natural blessings they as a community are much worse off than those living in the towns. In winter it is usual to over-heat the living rooms of the farm house, and fresh air is carefully debarred an entrance. The odors of cooking and of stale food are often allowed to pervade and pollute the atmosphere. Vegetable matter is allowed to decay in undrained and damp cellars, the products vitiating the air of the house. A little more knowledge regarding the inevitable consequences of breathing and, worst of all, re-breathing, impure air, and of the value of pure fresh air for preserving a robust health, would be of great practical benefit to farmers. In the summer time their lives are spent chiefly out of doors, and the houses are open, so these remarks have special reference to the air inhaled during the winter. With regard to the water, that which I shall now say has a wider application. The danger in impure water exists all the year round, though more particularly during the summer months, when the temperature is such that decomposition and putrefaction goes on apace, and the soil allows of an easy penetration of foul fluids.

Farmers' wells are often, for convenience sake, sunk in the barnyard, the stable or kitchen. If not in one or other of these places, we frequently find them situated dangerously near the privy, the pig-pen or other polluting source. If any drainage system is in force it is defective and at the best but partially effective. Too often we find no precaution whatever taken against infiltration of surface drainage. The kitchen and household slops find a temporary resting place on the ground close to the house, and perhaps only a few feet from the mouth of the well.

The natural result of this condition of affairs is that much excremental and waste matter finds its way into the well. Repeatedly I have found the farm well to be acting in the capacity of a cesspit and its water, not to speak in an exaggerated manner, to be a dilute form of liquid manure. Chemistry has again and again confirmed what common sense might lead us to expect, that such well waters are often highly charged with urine and decomposing organic matter. When men and beasts have to drink such water can we wonder that

disease and sickness overtake them? That more sickness does not prevail under such circumstances, I can only account for by natural robustness of constitution, by the immunity possesssd by all animals to a greater or less degree to which I have already referred, and to the vigorous and active life in the open air, common in the country.

In light and sandy soils, drainage will travel long distances, and especially so if the inducing factors of a well are present in the vicinity. The amount of drainage, the character of the soil and the incline of the strata, the rainfall, subterranean currents and the depth of the well, all go to determine the extent of the pollution. Were there not numerous cases on record that have received scientific proof, the distances that such drain may travel would often appear incredible. When the upper soil is light, it is not unfrequently underlaid at no great depth by impervious clay. This forms a natural bed for the soakage to flow upon until it flows into the well, which is usually sunk some few feet into the clay, and thus, as I have already said, a cesspit is formed.

Nor is it sufficient to prevent this that the soil be heavy and clayey. For though naturally it is more or less impervious it eventually becomes saturated with filth.

During the last four years I have had the opportunity of studying the qualities and sources of farmers' water supplies. The Government, through the chemical department of the Experimental Farms, has considered the examination of the waters from farmers' wells a useful and valuable work for agriculture and agriculturists—and indirectly for the dairying interests and the health of citizens The prosperity of the farmer must depend largely on his health and the health of his animals, and it is agreed by all that good health does not follow the use of polluted water. To milkmen and dairymen, to those who sell their milk to the cheese factory and the creamery, as well as to those who consume milk and its products, this is a matter of grave importance. Pure and wholesome milk can only be obtained from cows supplied with pure, fresh water.

The results of our analyses made in the laboratories of the Experimental Farms at Ottawa are to be found in our annual reports. The analytical data are tabulated and the deductions from them stated, together with such information as was obtained regarding the location of the wells and their surroundings. The record is that 70

per cent. of the waters examined have been condemned as entirely unfit for use, some few of these being so bad that I have advised their use for irrigating purposes and the forcing of vegetables. Not 10 per cent. of the waters would fall into the first-class when judged by any known standard of purity.

I sincerely trust that this does not really represent the condition of the farmers' well waters throughout the country. I certainly think that as it is only the sick that consult the doctor, so it is only those who have a strong suspicion of their water being polluted that have sent their samples to us. Yet, nevertheless, my personal observation, together with the analytical data that I have been enabled to accumulate, leads me to the opinion that polluted water is much more common than is usually suspected.

Allow me to give you some particulars, omitting the chemical results, of wells, the waters of which were being drunk at the time when the samples were sent, but which nevertheless were polluted by drainage.

Depth of well 40 feet, in light soil resting on clay, distance from privy 80 feet, from barn 300 feet. Well dug 23 years ago and not lately cleaned.

Depth of well 25 feet in clay loam and loose rock matter, 50 feet from privy.

Depth of well 30 feet in gravelly loam, within 20 feet of a cesspool and 40 feet from a privy.

Depth of well 25 feet in gravelly soil, privy within 50 feet.

These descriptions have been taken haphazard from my note book, avoiding those whose position in the barn-yard and stable precludes the possibility of their escape from contamination.

As far as I am aware we can only cope with this evil of impure water on the farm by instruction and advice. We must preach and keep on preaching the imminent danger to health there is in consuming water polluted with excreta. The co-operation of the press should be secured in this matter, for the evil is widespread. We must caution those about to dig wells not to locate them in the barn-yard or stable nor near the pig-pen or privy. They must be told that the consequences are inevitable and sooner or later will fall upon them or their children. Pure water must be looked upon as a desideratum to be obtained at all costs. When wells have once become

polluted by drainage of the nature I have referred to, they must be abandoned. From surface water and the entrance of foreign substances at the mouth of the well, they may of course be protected.

A slight acquaintance with the geology of the district will be of great assistance in determining the location of a well. A knowledge of the character and dip of the strata often affords sufficient data to wisely and safely locate the water supply. Now that windmill pumps are obtainable at reasonable figures, there is no excuse for sinking the well within a few feet of the farm buildings.

Having this accomplished, *i.e.*, the well suitably located, the necessity of periodically cleaning the wells (for small animals frequently find a watery grave there), and of preserving the precincts free from any accumulation of filth, must be enforced.

The value and importance of effective drainage and the use of absorbents must also be inculcated. The waste of fertilizing material, and valuable plant food, that annually takes place on the average Canadian farm through the lack of drainage and absorbents is enormous. The commercial aspect of this, apart from the hygienic, ought to be quite sufficient to alter the present methods—if such may be called—on the farm.

Our rigorous winters preclude many from adopting an adequate system of drainage for stables, cowsheds, etc., but there is no reason why absorbents should not be plentifully used all the year round. Of all the absorbents I can recommend none higher than ordinary swamp muck in air dried condition. It is a material rich in nitrogen and therefore of considerable value as a fertilizer in itself. It is an excellent absorbent and deodorizer, and may be used to advantage as a bedding material for animals. It not only preserves the plant food from going to waste but adds much value to the resultant manure. Vast deposits of this material occur all over the Dominion. All that is necessary is to dig it and allow it to dry in the air. It may be used plentifully in the cow-house, the pig-pen and the barn-yard, indeed wherever there is fluid excreta to absorb.

It will rightly form the basis of the compost heap, where the slops should find a place together with garbage, vegetable refuse and the carcasses of any animal that may die upon the farm. All these waste materials that otherwise would pollute the air and water of the farm are here converted into valuable food for succeeding crops. The

compost heap of late years seems to have fallen into disregard. The progressive farmer of the future will find it not only a means of preserving a healthful surrounding, but also a valuable bank where he may deposit in safe keeping and at a good interest materials otherwise worse than worthless to him.

I have purposely avoided making this a chemical paper in the technical sense of the term. However, before closing I would say a word or two to those who diagnose a water from a qualitative examination. The results of such are often very fallacious. It is only in the rare cases of extremely good and very bad waters that such can be relied upon. The odor, the color and appearance, the amount of precipitate with nitrate of silver, the discharge of the color of potassium permanganate, afford the usual data upon which the conclusion is based. The odor of even very bad samples may be only apparent on the heating of the water, and frequently waters that under such conditions give out no marked odor, may by analysis be proved to be polluted. A water may be bright and sparkling and yet seriously and dangerously contaminated, and again, another sample may be deeply colored and brown through the presence of dissolved peaty matter of a comparatively innocuous character. The appearance of a water is often very misleading, and is only of service at the best of times as corroborative evidence. The amount of chlorine also, as shewn by the precipitate of nitrate of silver, only becomes a sign of pollution when taken in conjunction with the amount of free ammonia associated with it. Still more misleading when taken by themselves are the results of the permanganate test. A peaty and comparatively pure water decolorises a very large quantity of permanganate compared with the amount required by a water reeking with excremental filth. There are very few instances in which a complete analysis is not required before a correct diagnosis can be arrived at. Water analysis is a special branch of analytical work, and the correct interpretation of results requires considerable experience, but full information as regards the well and its environment.

CITY OF TORONTO WATER SUPPLY.

By J. J. Cassidy, M.D., Toronto, Chairman Provincial Board of Health.

Mr. Chairman and Members of the Association,—That the present water supply of Toronto is defiled with sewage is acknowledged. That it is likely to continue so is also true, inasmuch as there is no good reason to think that any important improvements will be effected in the conduit, or that, even if that wonderful engineering device should be made perfectly tight, it would remain so. Besides, sewage-tainted water according to the direction of the wind has been found near the intake. Many plans might be discussed by which these defects could be removed. For instance, a tunnel could be constructed under the lake extending from the pumping well three miles out in Lake Ontario. If raw sludge were not dumped into the lake near the source of supply, as is done at Chicago, and more particularly, if no raw sewage were discharged into Toronto Bay and Ashbridge's Bay, the Lake Ontario supply ought to be reasonably good the year round. As illustrative of what a great city is doing in order to obtain an unlimited quantity of lake water (quality not considered), the following summary of the present capacity of Chicago in the matter of water supply is given:

Pumping Stations.

1. Lakeview	31,000,000
2. North side	98,000,000
3. Central	36,000,000
4. Fourteenth street	54,000,000
5. West side	60,000,000
6. Sixty-eighth street	77,000,000
7. Washington Heights (Artesian Well.)	500,000
Total capacity for twenty-four hours	356,500,000

TUNNELS.

1. Lakeview	72,000,000
2. Chicago avenue	220,000,000
3. Four mile	140,000,000
4. Sixty-eighth street	72,000,000
Total capacity for 24 hours	504,000,000

For present needs and for many decades to come a six foot tunnel supplying 72,000,000 gallons of Lake Ontario water would be ample. If protected from sewage pollution the quality of the water ought to be excellent. I am not prepared to discuss the engineering or financial sides of the question. I simply assume that Toronto wants to obtain Lake Ontario water unmixed with bay sewage, and is prepared to pay for the luxury. If a tunnel cannot be built, filtration of the present supply would be an excellent method of obtaining a water of good quality at a small outlay. I have already advocated this plan, and think that if the city of Toronto is determined to obtain her water supply from Lake Ontario, the best and cheapest plan is to filter through Hyatt filters the more or less impure supply obtained from the conduit before discharging it into the mains. There is yet another plan by which a partial supply could be obtained very soon and later on a complete supply.

The York Waterworks Company was incorporated for the purpose of supplying Toronto and the surrounding municipalities with water by gravitation from the highlands north of the city. They have made many tests and explorations for a period of over two years, and they are now prepared to offer the city of Toronto an abundant supply of pure water at a rate more than one-half less than the cost of the present one.

The present impure supply costs 7.18 cents per 1,000 gallons. The York Waterworks Company offers pure spring water at 3.25 cents per 1,000 gallons.

In foreign countries it has, in many cases, been practically demonstrated that such underground waters exist in unlimited and inexhaustible quantities, furnishing abundant supplies to great cities. Brooklyn draws 30,000,000 gallons daily from pipes driven into a

sand stratum within twenty feet of the surface; from 125 two-inch pipes within an area of one-eighth of an acre, over four million gallons are pumped every 24 hours.

In Europe, such large centres of population as Paris, Vienna, Florence, Toulouse and Lyons, are in great part so supplied. Further in Ontario, the following towns are supplied with undergound water, Barrie, Brantford, Dundas, Galt, Leamington. London, Milton, Newmarket, Penetanguishene, Woodstock and Walkerton. Goderich obtains within a quarter acre of ground a daily supply of two million gallons from six 8-inch borings to a depth of about 240 feet. These great springs have been flowing for years without any signs of exhaustion. It is evident that they do not depend on isolated accumulations of water, but on underground currents giving a steady and permanent flow. There is, therefore, nothing chimerical in the proposition to supply Toronto in a similar way. And as to their permanency it is only necessary to say that such a thing as an artesian spring failing is nowhere recorded, and we have, therefore, no more reason to think they will give out than we have to think that Lake Ontario will go dry.

Having shown that such underground sources are both ample and permanent, the purity of the water is the next consideration. It is not necessary to dwell long on this point. Water becomes loaded with organic impurities only when exposed to sunlight and air, or when brought in contact with surface soil. Of course the product of even the deepest springs has been at one time absorbed at the surface, but its long course over rocky beds, and through sand and gravel, has been the means of purifying it by both chemical and mechanical action. The analyses of such waters confirm the universal opinion of their wholesome purity.

There is another important point, that is, the continued and assured high pressure of water for the purpose of fire protection. It is easy to conceive a water famine take place from the breaking down of the pumping engines or through anything going wrong with the machinery necessary to successfully carry on pumping operations. How disastrous the effect upon the city would be in case of a large fire breaking out, with no pressure of water to control the same? Under a system of gravitation this can never take place.

The company's principal location is on the highlands, about two miles north of the city limits. This property is on the crest of a hill, the ground falling away on all sides. Beneath the layer of surface clay there is a bed of water-bearing sand and gravel capable of furnishing an enormous supply. The tests already made have satisfactorily proved this point, a conclusion vindicated by the fact that there is one well in the locality supplying the town of North Toronto with 250,000 gallons per day. This well is sunk only ten feet into the gravel.

The existence of a large quantity of water in so elevated a locality, 420 feet above the bay, is explained in different ways.

It is known that the clay underlying Lake Simcoe extends to the south of Newmarket at a considerable depth, and is overlaid by strata of sand and gravel saturated with water. Some believe that this special formation does not suddenly terminate at that point, but is confined between two beds of stiff clay and extends much farther in a southerly direction. This may be so, and the property spoken of may be a part of the great natural conduit through which water from Lake Simcoe filters for 30 miles. Dr. Bryce, in his pamphlet written before this water was known to exist, says: "If in this latter locality (speaking of Thornhill and the possibility of Toronto water supply) there should be found a widely distributed layer of water-bearing sand superimposed upon a bed of clay, and having a head of water extending back as far as Lake Simcoe, there seems no good reason why it should not supply ample water for purposes of a large city." Others think these underground waters are the collections resulting from an extensive area.

The following analysis of the water by Prof. Ellis, of Toronto University, conclusively settles the question of its purity:

"The analysis of the sample of water from North Toronto, left me for analysis, is as follows:

Chlorine	2 parts per million.
Free ammonia	0.04 parts per million.
Albuminoid ammonia	0.03 parts per million.
Oxygen absorbed by permanganate in 15 minutes	0.16 parts per million.
Oxygen absorbed by permanganate in 4 hours	0.32

Total solids..... 40.500—28.35 grs. per gal.
Phosphate..... None.
Hardness ....265.00—18.55 Clarke's scale.

I am of opinion that the water is of excellent quality.

(Sgd.) W. H. ELLIS.

In addition to the North Toronto site the York Waterworks Company has two other locations, one in the northern part of the township of York, and another in the northern part of the township of Vaughan. In none of these places is the water less than 400 feet above Lake Ontario.

The North Toronto location, which is about two miles from the northern city limits and half a mile west of Yonge street, is the highest point for miles around, being about 420 feet above Toronto Bay.

At the eastern brow of this hill, overlooking Yonge street at a height of 65 feet, is the head of a valley running in a north-westerly direction. This valley continues more or less clearly defined, for several thousand feet. However, it is with the head of this valley that we are concerned. At a distance of about 800 feet from the valley's head it measures 865 feet across. Running down its centre is an underground river from 340 to 500 feet in width, and from 10 to 25 feet in depth. The water is found in coarse sand and gravel, which is overlaid by a bed of clay from 2 to 25 feet thick.

The well for the town of North Toronto is just within the margin of this river, and it was found that the gravel was 10 feet in thickness, and the capacity of the well 300,000 gallons per day. When making tests last summer the York Waterworks Company pumped over 1,500,000 gallons per day from a well in the centre of the flow. The company offers to supply Toronto 4,000,000 gallons in six months, 14,000,000 gallons in eighteen months, and 24,000,000 gallons in thirty months. The reasons for thus dividing the supply are (1) because the proposed mode of construction made it impossible to divide the supply in this way without very much increase in the cost of construction, and (2) because it was thought the citizens would appreciate an offer that would mean an almost immediate partial relief. Four million gallons of water per day will give the district above College and Carlton streets a pure, unmixed supply, as the city is divided from east to west by a line of

valves along the streets named ; besides this amount would increase the fire pressure all over the city 50 lbs.

The company proposes to obtain the first 4,000,000 gallons by running a tunnel under the hill across the bed of the underground river. This tunnel will be constructed of open brickwork laid dry, and will be from 45 to 60 feet below the surface. This, while it will give the city a speedy partial supply, will also dispose of a large quantity of the water, and thus make it easier to do the actual work necessary to secure the complete flow of the river. This work will consist in constructing a dam about 800 feet long and 25 feet high ; the crown of the dam will be 15 feet below the surface. It, of course, will be built on the lower side of the tunnel.

This dam will answer two purposes. (1) It will intercept the whole flow of the river, and thus it is estimated increase the flow to 14,000,000 gallons ; (2) it will form a reservoir which will equalize the flow. At the same time it is not thought that in an underground system, such as this a reservoir is as necessary as in an ordinary river supply, because it is known that underground rivers do not increase and diminish in their flow.

The tests, engineering work and plans for the project were all laid last summer ; but this is the first time the actual plans have been made public.

The temperature of the water is 45° F.

I would recommend, therefore, that the city purchase water from the York Waterworks Company, the water to be connected with the Toronto water system by a large main extending downwards on Yonge street as far as Bloor street. The northern portion of the city would thus secure an immediate supply of pure spring water. Later on the southern portion of the city could also be supplied. A clause might be introduced into the agreement by which the city could secure the ownership and the rights and property now possessed by the company.

It is quite true that the supplying of 18,000,000 gallons of water per diem from sources which are not visible to the naked eye, like Lake Ontario, may to many seem chimerical, but the evidence adduced will, I hope, convince you that this plan is quite feasible. The purity of the water is undoubted. It is also cheaper than the present supply, and the pressure on the pipes by gravitation will be greater

THE SPUTA OF CONSUMPTIVES AS A CAUSE OF DISEASE.

By W. H. Lowry, M.D., Guelph.

Mr. President and Gentlemen,—In drawing the attention of the Association to this subject, I may state at the outset that this brief paper of mine does not presume to do more than introduce the subject for discussion, so that to those present who are versed in sanitary matters an opportunity may be given and taken advantage of to express their views upon it, and if the conclusion be that there is danger to the commonwealth from this source, surely no better medium could be found to transmit the note of warning to the public than the "Association of Executive Health Officers of Ontario," and possibly from no other place of meeting than from Guelph would such warning be considered so obligatory and authoritative, seeing it would carry with it the no small honor of having been heralded from the Royal City itself.

In these days, when the terms bacteria, microbe, bacillus, micrococci and many others much more unpronounceable are so frequently referred to, and when through the investigations of scientific men these various low forms of life have been demonstrated a reality, it does not require much courage to speak of any of the ills to which "flesh is heir" as being the result of a specific germ.

A poet speaks of a malady affecting a young countryman as a "love-sick swain," whose case I will not yet include in the foregoing statement, though when we see the startling announcement in the newspapers "nowadays" of miracles occurring in so many counties throughout the Province, there may be reason to look for the discovery of a "bacillus" more microscopical in dimensions than the little figure with wings, bow and arrow, that has so long done such noble duty in this latter affection.

In the case of consumption, whatever divisions of its causes have been made by authorities all, or nearly all, have admitted *contagion* as being more or less important as a causation. However, the par-

ticular or active element in the process of contagion or infection was not determined until the labors of Dr. Koch culminated in the announcement that the bacillus of tuberculosis had been discovered, which fact has been fully proven by many others.

Though not pertaining to our subject, we cannot help expressing regret that the brilliancy of position occupied by Prof. Koch as a bacteriologist has been dimmed by his recent escapade in obtaining a divorce from his wife in order to the marrying of another. We have not understood that the frequent or prolonged use of the microscope tends in this direction, and we hope that any of the members of this Association who are in the habit of employing the microscope will not forego their labors from the fear of a divorce court and an additional wife some time in the future.

We have read in some of the older books that consumption may be hereditary or acquired. The former—that is heredity—which, by the way, some are beginning to doubt, we will pass; but regarding the latter, or so-called acquired cases, we venture the remark that it might be a revelation to us could we determine how many acquire the disease, not from repeated colds nor as a result solely from the deteriorating effects of other forms of disease, but from the entrance of the consumptive germ from without.

Repeated colds, as they are termed, and lowered vitality of system, to which condition—or want of condition—the term hypertrophy has been applied, may possibly after all do no more than make ready a most receptive soil where consumptive germs, set free in the air and being inhaled, obtain a foothold, and never relax until their deadly work is complete.

In diphtheria we are all most particular, and rightly so, in the free use of germicides, and that all discharges from the nose and throat may be either destroyed or rendered harmless; but so far the same exacting precaution has not been thought of in the case of consumptives. Greater difficulty presents itself in the case of the latter on account of their chronicity, and their being allowed to take care of themselves to a great extent, while in diphtheria or other acute diseases the case is immediately under control and the discharge kept

within our reach. Yet, if we accept the germ theory at all as a cause of consumption, there is possibly greater reason that the public be aroused to the danger, seeing that the greater number of those suffering from this disease are abroad, and not confined within a building, the approach to which has been duly placarded as set forth in the "Health Act."

It is not a romance of which there may be doubt, but a scientific fact, that there is a germ contained in the sputa of consumptives capable of setting up the disease in others, and upon the walls and furniture of rooms occupied by those, diseased germs have been demonstrated; and it has been further proven that animals have had the disease produced from the sputa by breathing, inoculation or swallowing.

In addition to this truth, when we take into consideration the fact that hundreds, and possibly thousands, of the unfortunate victims of the disease frequent our public streets, railway cars, halls, churches and dwellings, each one a germ-producing centre, we may not wonder that this disease stands high in the order of fatality, as seen in the published statistics of the Province and Dominion.

There is a saying that "It's an ill wind that does not blow good to some one," but not so here, as the wind that conveys the floating germ not only fails to benefit the sufferer, but may do positive injury to the individual into whose lungs it has been breathed.

Now, in the way of arrest of these germs, what are we to do? We cannot isolate, as in the case of the other disease already referred to; indeed, it would be cruel to even hint at such a thing. Rather give them the freedom of the free air of heaven, as no other class more need it, and by reason of their long suffering and disappointed hopes none more richly deserve it.

We must not have the consumptive suppose that he is, or that he is looked upon as something akin to a leper, or that there is within him that which should ostracize him from his family, his friends or from society.

No class of patients is more sensitive, none more possessed of the finer feelings, none more hopeful of their condition, hence the

greater need of delicate dealing with the matter, and the greater reason that we avoid wounding unnecessarily the feelings of those whom we desire only to benefit.

We would not go so far as to say that special legislation would be needed, as we believe if public attention were directed to the fact that there *is* danger from the sputa of consumptives as a source of disease, and if certain common sense suggestions set forth as emanating from this Association were duly made public, the victims of disease and their friends would see the reasonableness and fully recognize the duty of complying therewith.

We think the whole matter is worthy the consideration of this Association, and fairly claims attention from any organization that recognizes the prevention of disease as the grand design of its existence.

NOTES ON THE PREVENTION OF DISEASE.

By A. Groves, Esq., M.D., Fergus.

Mr. President and Gentlemen,—There is no matter of more importance to the people in general than the suppression or prevention of disease, and in regard to no question of first-rate importance is the great mass of the people so utterly apathetic. Even in the medical profession, it must be confessed, more attention is paid to the cure of disease than to its prevention, and perhaps this is not greatly to be wondered at when it is recollected that the physician is paid for treating the sick, but he gets no fee for the infinitely more useful service of preventing the well from becoming sick. The practitioner who is called in to attend a case of typhoid or diphtheria is cheerfully paid a good fee for his services in treating the case, but for his much more valuable services in preventing the spread of disease no remuneration is offered nor apparently expected. The basis of payment seems to be totally wrong, for it cannot be just to pay the greater fee for the smaller benefit. It is said that in China the physician's clients pay him so long as he keeps them in health, but when sickness comes payment is stopped and, I must confess, that to me this appears a more sensible and philosophical arrangement than our method. With the Chinese, evidently prevention is the first thing thought of, whereas with us it is first cure and afterwards prevention. There is no doubt an immense work has been done by the medical profession in the way of stamping out and preventing disease, but it is as nothing to what remains to be done. The first great requisite is to thoroughly impress upon the people this undoubted fact that a large proportion of the diseases which affect mankind is preventable and exists only on account of ignorance, neglect and carelessness. All contagious and infectious diseases, all diseases in fact which are caused by a specific germ are capable of being either wholly or in great part suppressed. Not only must the profession understand themselves, but they must unceasingly teach the people that no circumstance or combination of circumstances, except the actual presence of the specific germ, can cause such diseases as typhoid fever, cholera, tuberculosis, diphtheria,

small-pox, scarlet fever, measles and all others of a similar nature. I find there is a widespread belief that filthy surroundings will of themselves give rise to and produce typhoid fever, diphtheria, etc., but although dirt and filth undoubtedly afford suitable ground in which to cultivate certain forms of disease they cannot originate their germs. For example, typhoid fever is never generated spontaneously any more than small-pox. It is a result of the introduction into the system of a specific bacillus without which typhoid fever cannot occur, and this bacillus is produced only from a pre-existing bacillus and in no other way. It can no more produce itself or originate spontaneously than a horse or an ox can do so, for both it and they are descendants of distinct races of living beings which produce only after their kind. Again, take tuberculosis of the lungs which is so commonly said by the laity to arise from a neglected cold, a thing to which the profession gives a tacit consent if not even a warm approval. It ought to be definitely understood that the hazy and indefinite pathalogical condition known as a cold never did produce tuberculosis; that at most it only left a condition favorable to tubercular development. All the conditions commonly and generally supposed to produce tuberculosis, together with every predisposing cause, such as hereditary predispositon, cannot give rise to consumption without the presence of the specific bacillus, and the same thing is true of every disease of bacillary origin. Just here I might be permitted to diverge for a moment in order to protest against a most mischievous idea that is widespread and is as false as it is ubiquitous; I refer to the belief that disease can change from one thing to another. I have heard, for instance, of cases where the patient had so-called bilious fever in the first week of his illness, turning to typhoid in the second, becoming inflammation of the brain in the third and ending in death from heart failure in the fourth. The people, as well as the profession, should understand that a given disease is a definite and constant quantity which never becomes anything else but itself. If then it be admitted that each disease arising from the entrance of bacilli into the system is a separate and distinct entity which can be caused in no other way, then our whole energies should be thrown into the struggle against those bacilli which are so destructive to human life and happiness. It must be understood that every person affected by a germ disease is a focus of infection, and careful pre-

cautions should be taken to destroy the germs originating in him. In an ordinary case of consumption not less than three or four billions of bacilli are thrown off daily from the lungs alone, and it is found the locality occupied by the patient is saturated with the germs of the disease to such an extent that dust scraped from the walls is infective long after the removal of the patient. These germs are not expired in the air but are found in the sputa and other discharges of the body, and it is only after these discharges have dried and become dust that they are inhaled by those in the neighborhood, who in this way contract the disease. The tenacity of life exhibited by bacilli is most remarkable. I know of an instance where the diphtheria poison retained its virulence for two years although exposed to the ordinary temperature of our climate, and typhoid germs appear to lose no part of their activity by reason of exposure to a temperature below zero; in fact it is well known that typhoid germs will retain their activity for months in the severest weather, ready to communicate the disease to any one into whose body they may be introduced. We find germ diseases carried long distances by water supply, by milk supply, and I believe often by other food supplies, by clothing and probably in many other ways; and when the countless myriads of germs produced in the progress of a single case is considered, the wonder is not that many are affected, but that any escape. There is but one way by which germ diseases can be prevented, even theoretically, and that is by the destruction of the germs from which alone they originate, and I am persuaded that there is but one absolutely certain method of destroying those germs and that is by fire. In the case of the consumptive, the sputa and every other discharge from his body should be burned immediately, As the sputum is the chief vehicle by which the disease is conveyed, especial care should be taken that it be all destroyed and for this purpose a receptacle should be constantly carried by each patient in which to collect all expectorated matter, and this receptacle and its contents should at short intervals be committed to the flames. The discharges in like manner in typhoid should be burned instead of as at present buried in the earth or mingled with sewage to poison all around. The same treatment of purification by fire should be applied to all germ-bearing discharges from whatever diseases they arise. Chemical disinfectants may, when carefully and scientifically applied, be moder-

ately effectual in destroying germ life, but fire is absolutely certain in its effects. There is no question about the innocuousness of a discharge which has passed through a furnace. I might here warn people against trusting in the senseless and worse than useless habit of going through a form of disinfecting a sick room by exposing in it some bad-smelling substance. Many people seem to have a superstitious belief in the germicidal efficacy of evil-smelling drugs and as a consequence pollute the air of the sick chamber with the odor of sundry saucers of chloride of lime or something equally disagreeble and equally useless. It will be a distinct gain for patients when it is universally recognized that disease germs will thrive in an atmosphere saturated with disinfectants far beyond the point at which human life can be sustained. If a disinfectant is so used as to be ineffectual and to be in reality no protection its use is reprehensible and dangerous, for it begets a false feeling of security and precaution is lulled to sleep in the arms of ignorance. The best disinfectants for the sick room are sunlight and fresh air, and both are good in proportion to their purity.

Finally and briefly, I wish to draw your attention to what appears to me a fruitful, and, generally speaking, unrecognized cause of disease being propagated and a cause easily remedied were it not for prejudice and custom, those two powerful clogs which ever block the wheels of progress. I refer to the custom of burying the bodies of the dead and with them countless numbers of disease germs to fester beneath earth's fair surface and poison every running brook. Not only is it true that disease germs will remain active in the earth, but it is actually asserted by great authorities such as Pettenkofer that the poison of typhoid fever, for instance, is not capable of communicating the disease until after it has entered into the soil when the bacilli undergo development. I have known many instances when there did not appear to be any reasonable doubt that disease originated from wells fed by springs arising in a cemetery. If it be true that the discharges from the bodies of the sick ought to be destroyed to prevent the spread of disease, how much more necessary is it to destroy the bodies of the dead which very often are simply reservoirs of disease germs carefully placed in the soil in a way well calculated to infect all in the neighborhood. In the interests of the living, cremation of the dead is urgently demanded. Let everything cast off by the sick, including their cast off bodies, be purified by the one certain and

infallible germicide—intense heat. I am convinced that along this line will be found the true means of arresting disease. The search for specifics to arrest it after it has begun is highly commendable, but there is this serious defect that it is attacking effects, whereas the true method is to destroy the cause. It is true there is a popular prejudice against cremation, just as it is said there is a national sentiment amongst the Esquimaux against washing themselves; but on the other hand the love of life is a powerful influence, and it is possible the instinct of self-preservation may very materially aid in bringing people to consent to a better method of disposing of the dead. The study of bacteriology has taught us that microscopic germs are the undoubted cause of many diseases; let us then apply to these germs the radical treatment by fire. In addition to those diseases which are of germ origin, there is one condition sometimes classed as disease and undoubtedly leading to severe and fatal forms of trouble which it is quite possible to eradicate—I refer to alcoholism. This subject is one which anyone essaying to consider the arrest of those preventable ills which shorten human life must take into consideration; for the amount of misery, suffering and death caused by alcohol is simply appalling, wholly unnecessary and mainly preventable. There is perhaps no one cause so responsible, directly or indirectly, for increasing the sum of unhappiness, disaster and death as this agent, and yet the amazing fact remains that special legislation is enacted for its production and sale, and governments are not ashamed to grant licenses to and receive revenue from this prolific source of disease.

On the ground of public health we ought to use every means to suppress the manufacture and sale of liquor and so stop its unnecessary ravages.

The prevention of all diseases caused by alcohol is theoretically exceedingly simple and differs from the prevention of germ diseases in this, that whereas in the latter it is necessary to destroy the cause, in the former it is only required to abstain from manufacturing the cause. Governments and legislators must be educated up to this point at least, that they will no longer pass laws to provide for the production and regulate the dissemination of that which causes disease. When education and civilization have sufficiently advanced, I believe diseases, such as consumption, cholera, typhoid and the like, will practi-

cally become things of the past. When the manufacture of alcohol is prohibited, and excretions from the sick are no longer allowed to infect the healthy, and the bodies of the dead are so disposed of as not to endanger the living, then shall alcoholic and other diseases cease to decimate the people and the three score years and ten allotted to the life of man shall become the rule and not the exception.

THE EPIDEMIOLOGICAL ASPECTS OF OUTBREAKS OF SPECIFIC DIARRHŒA.

By Norman Walker, M.D., Toronto.

Mr. President and Members of the Association,—During the winter of 1892-93 an epidemic of diarrhœa occurred in Toronto, the symptoms were of such a choleraic character that the name "cholerine" was applied to it. Epidemics of diarrhœa in the winter being very unusual, and as the outbreak was so marked in Toronto, the Provincial Board of Health made enquiry of the city doctors, from whom we have record of 1,293 cases at least; but this is not by any means a complete record, because no accurate account was kept by the doctors. The enquiry was made before the cases had ceased and many cases occurred for which no medical man was called in. But certainly not less than 5,000 were attacked. The duration of individual cases lasted from a few hours to six weeks; the average duration of ilness was 5.0535 days. All but three cases recovered. One patient died in 36 hours, the diarrhœa being "associated with peritonitis." Cases were reported as having occurred during December, January, February and March; ten weeks were included in the enquiry. The number of cases for any particular week as gathered from the replies is relatively as follows: 1st week, 2; 2nd week, 6; 3rd week, 6; 4th week, 8; 5th week, 16; 6th week, 32; 7th week, 15; 8th week, 7; 9th week, 4; 10th week, 3. The gradual increase and decrease is very marked, the 6th week, from January 28th to February 4th, being the climax. The symptoms noticed were vomiting, nausea, increased temperature, cramps, pains located in the abdomen, in the back or in the limbs; prostration and weakness were very frequent; "watery stools" or "rice stools," very foul. Three doctors reported an urticaria-like rash; one had eight cases on whom the rash lasted two or three days; a tendency to typhoid or a tendency to relapse; influenza-like, symptoms, bronchial trouble; intense headache, hæmorrhagic discharge; "two cases presented symptoms of enteric tuberculosis." "Have seen one or two *post mortems* on cases of intense inflammation of the mucous membrane of the large intestine different from anything I have before noticed"; "liver at fault in all cases," "malarial character," etc.

That polluted bay water caused this epidemic is quite certain. Owing to weeds the lake end of the water-pipe was blocked, the water was pumped out of the whole pipe from the lake to the waterworks well, and the pipe rose like a great sea serpent on December 25th, 1892.

Some cases of choleraic diarrhœa occurred before this so-called accident. These may be accounted for by the fact that there had been a leak in the well amounting to one and two-thirds per cent. of the whole water supply. Those cases where no water was drunk, or where tea and coffee only were used, may be accounted for by the ptomaines or toxines in the water, or by those people using tap water to clean their teeth or wash their dishes with, or by infection from other cases. Furthermore, we have the evidence on the other side that the cases ceased in a number of houses as soon as they began to boil the water, and many houses, where the water was boiled from the time of Dr. Allen's order, escaped altogether. My personal experience in using water filtered through a Chamberland filter was perfectly satisfactory. Cases were said to have occurred outside the city, but there must have been some local cause for these, or infection from Toronto. There was nothing exceptional in the weather reports for Toronto until January, which was steadily very cold.

Having this record for Toronto, I sought for records of like epidemics elsewhere.

There was a winter epidemic of diarrhœa in London, England, during the winter of 1886-87. I could find no record beyond a number of letters in the Lancet and British Medical Journal, the first of which was dated February 5th, to the effect that Dr. Kerr had had 50 cases in six weeks, the symptoms being lowered in temperature, 95° to 97° F., stools fluid, collapse, thirst, vocal hoarseness, cramps, vomiting, prostration. All ages were affected, and the cases extended over localities widely apart, the water supply being the only common condition; several drank only tea and coffee.

Lancet editorial, February 5th, 1887, says: "It is unusual to hear of any epidemic prevalence of diarrhœa during the winter months, yet there is little reason to doubt that a large number of persons in London have, during the past few weeks, suffered from this malady, and this in a manner which raises a strong suspicion of community of

cause. [The subject is one that would likely enough escape attention, for the ailment is not of a character to influence death returns; nevertheless the diarrhœa is sometimes associated in its etiology with other diseases of a serious nature, and we cannot regard the appearance of groups of cases of this affection without some anxiety as to its meaning.] Health officers would render valuable services by placing themselves in communication with medical practitioners in their districts, for the subject is worthy of investigation."

Also in speaking of the death of Sir Francis Bolton, the Commissioner on Water Supply, and the appointment of his successor: "The drinkers of water supplied by the Thames have much ground for anxiety at the present time. The published reports of Sir F. Bolton raise serious question as to the propriety of continuing those supplies which are derived from the Thames at a suspicious proximity to the localities of the discharge of sewage."

On February 12th the house physician of West London Hospital wrote that "during the last four weeks the causalty and out patient departments of the West London Hospital have attended to an outbreak of a severe form of diarrhœa." The cases exceeded in numbers those of the summer months. Symptoms were similar to those already enumerated, except that there were "bloody stools" "in a few cases," and a rise in temperature, and duration of illness was from three to eight days. The districts affected are named, and he concluded that the water was the only common factor.

February 19th, Cases reported from St. James, Bayswater and Kingston on Thames. Also Dr. Keith, of Aberdeenshire, reports twenty cases, and says that in houses, small and crowded, with no sanitary arrangements, all the inmates were attacked.

March 19th. Eighteen or twenty cases reported for Forest Hill, S. E., also from S. W. London quite a number of cases and bad odor of stools is noticed. Also from Cheshire, prevalence of diarrhœa not confined to London. It has been epidemic here for the last three weeks, mother and father attacked successively, stools very bad odor; could find no local cause, but blamed three cases to stool emanations.

Also Dr. Sykes, the Medical Officer of Health, reported that there was no epidemic in St. Pancras. I find that the St. Pancras water supply is from the New River and not from the Thames.

March 26th. Dr. Kerr writes again: "Since my letter I find that there has been an enormous number of cases. I have learned that during the last three months a large number of medical men in London have been attacked. Some were so prostrate that they were ordered away for a space to recover their strength. The Medical Officer of Health for Marylebone refers to the outbreak, and reports one or two fatal cases. Also from the north and north-west of London comes a report in which it is noted the fact of several cases occurring successively in one family."

April 2nd, 1887, from Kent: "An unusually large number of cases cause a mystery, because it is a country practice, with milk and water supplies all different. Successive attacks, the wife, then the husband, therefore it must be infectious.

The weather reports from October to March show that October was unusually warm. In November twenty-seven days had a temperature above normal, and the rainfall was below the average, that is to say, the weather was warm and drier than usual. December was cold and very wet. During January and February the rainfall was less than half the normal amount, and the temperature, whilst very near the average, showed marked and rapid variations. [Further, it was reported that diarrhœa was the most fatal zymotic disease in England and Wales during October, November and December, 1886.]

Thus we see that the micro-organisms of the summer epidemic of 1886 would not have any adverse conditions until December. The excessive rain of December must have washed an excess of organic matter, both animal and vegetable, into the Thames. This organic matter, with its micro-organisms, would be caught on the filters, and as the filters were not well administered at that time, the water supply to the greater part of London would be contaminated, whilst St. Pancras, with its purer water supply, was free from any epidemic of diarrhœa. Thus we see that time after time, when there has been an epidemic of diarrhœa in the winter, polluted water has been the cause.

In July, 1866, an outbreak of diarrhœa and cholera at Southampton was attributed to emanations from "tons and tons of sewage containing excreta from known cases of cholera being pumped up and frothy, and agitated by this churning, were poured like a catar-

act down an open channel for some eight or nine feet." "There was no local cause, except the effluvia this disengaged." When this open channel was closed and carbolic acid largely used, the outbreak immediately diminished. Here we have proof that the micro-organisms were borne in this spray of cholera-contaminated sewage, causing the many cases which arose in the neighborhood.

Whilst making microscopical examinations during an epidemic of diarrhœa in the summer of 1878, Dr. Johnston was attacked five times.

June 4th, 1887. Report from Kingston-on-Hull. An epidemic of diarrhœa occurred in March, and on careful investigation it was found to be the result of pollution of water supply by excreta of persons suffering from diarrhœa at a period just anterior to the epidemic; the outbreak was peculiar in its suddenness, and in that it was limited to the houses supplied with Hull water. Eighteen thousand to 20,000 persons were attacked with no fatal results.

The City of Leicester has long been a centre of interest in connection with epidemic diarrhœa. Dr. Tomkins reports nearly 10,000 attacks during the summer of 1887. Two-thirds of those attacked were twenty years old and upwards. Investigation showed that the number of organisms in the air varied from 6,000 to 1,600 per cubic metre, the latter record coming from a district outside the diarrhœa area. Cultivations were carried on, and it was found that exceedingly small quantities of the infected liquified gelatine which swarmed with micro-organisms sufficed, when taken into the system, to induce a smart attack of diarrhœa lasting several hours. The soil in the diarrhœa area was sewage sodden, the solids being deposited in the sewer whilst the liquids percolated through the walls into the surrounding soil. In fact the sewers there were analogous to our cesspools and privy pits. Dr. Tomkins found that when the temperature of the soil at a depth of one foot had reached 59° to 62° F. then the epidemic diarrhœa started.

Dr. Ballard, as medical officer to the Local Government Board of Great Britain, in his report on diarrhœa gave the results of investigations extending over eight years. This report was published in 1888, and since it is the greatest authority on this subject to-day, no apology is necessary if I give a summary of Dr. Ballard's results and conclusions.

1. Out of 272,409 cases treated at Islington 60.5 were due to diarrhœa; the amount of sickness varied in different years; the deaths from diarrhœa amounted to about 43 per 1,000 of all deaths.

2. *Seasonal influence:* The malady is present throughout the whole year, but the epidemic period is the third quarter, that is during July, August and September. But from the reports I have given above it is evident that an epidemic may break out at any season when the local conditions are suitable or from the use of unwholesome food or polluted water.

General conditions: Dr. Ballard found that

1. The summer rise of diarrhœal mortality does not commence until the mean temperature recorded by the 4-foot earth thermometer has attained somewhere about 56° F. no matter what may have been the temperature attained by the atmosphere or recorded by the 1-foot thermometer.

2. The maximum diarrhœal mortality of the year is usually attained in the week in which the temperature recorded by the 4-foot thermometer attains its mean weekly maximum.

3. The decline of the diarrhœal mortality . . . . coincides with the decline of the temperature recorded by the 4-foot earth thermometer, which temperature declines much more slowly than the atmospheric temperature or than that recorded by the 1-foot earth thermometer.

4. The influence of the atmospheric temperature and of the temperature of the more superficial layers of earth . . . . is little if at all apparent until the temperature of the 4-foot earth thermometer has risen as stated above; their influence is apparent but it is a subsidiary one.

Soil: Diarrhœa mortality is low in places built upon solid rock. On the other hand a loose soil permeable more or less freely by water and by air is a soil on which diarrhœal mortality is apt to be high. The pollution of the soil with organic filth, whether vegetable or animal, is distinctively favorable to a high diarrhœal mortality. Excessive wetness and complete dryness are unfavorable to diarrhœa. A state of continual dampness, which is decided but not sufficient to preclude free aeration, is specially favorable to diarrhœa.

Dr. Ballard's working hypothesis. "That the essential cause of diarrhœa resides originally in the superficial layers of the earth where

it is intimately associated with the life processes of some micro-organisms not yet detected, captured or isolated. That on occasion such micro-organism is capable of getting abroad from its primary habitat the earth, and having become air-borne obtains opportunity for fastening on new living organic material, and of using such organic material both as nidus and as pabulum in undergoing various phases of its life history.

"That in food inside as well as outside of the human body, such micro organism finds, especially at certain seasons, nidus and pabulum convenient for its development, multiplication or evolution.

"That from food, as also from the contained organic matter of particular soils, such micro-organism can manufacture by the chemical changes wrought therein through certain of its life processes, a substance which is a virulent poison, and that this chemical substance is in the human body the material cause of epidemic diarrhœa.

"It will be observed that this provisional hypothesis is sufficiently elastic to include as a common cause of diarrhœa chemical products of bacterial life manufactured indifferently within or outside the human body.

"Elasticity to this extent of a provisional hypothesis has been necessary for the reason that in the present state of our knowledge certain cases and groups of cases of diarrhœa not distinguished from epidemic summer diarrhœa have now and again been found to possess the faculty of being directly communicable from person to person. That in the stools of such infective cases the causation organism may be looked for with good hope of success."

Micro-organisms in the soil cause the nitrification of the organic matter, but the soil below twelve feet is practically sterile. We know that these micro-organisms require air, heat and moisture, and therefore if the ground water is lowered to twelve feet below the surface the organisms will be dependent on the rains for moisture, but when the rain is very heavy or continued for several days, then the temperature is so reduced and there is so little air that the organisms cannot flourish, but just as soon as the rain ceases and warm days come then the organisms flourish until the earth gets too dry which again acts as a deterrent. Diarrhœa is like cholera in this respect as has been observed in the 1892 report of the Provincial Board of Health. Saturation or complete dryness will stop an epi-

demic. All conditions which impede the free movement of air and sunlight tend to increase diarrhœa. Density of population, joined as it is with poor people, careless and uncleanly in their habits, increases diarrhœa. Food bought in a state of partial decomposition or stored in a close, filthy pantry or where sewage emanations have access to it, is a frequent cause of diarrhœa.

That certain localities, cities and towns, and certain houses are centres where year after year diarrhœa breaks out is long since proved, and when the medical officer of health finds these centres the cause, whether dampness, want of air or sunlight or filth, when discovered must be eradicated. The number of deaths is no criterion of the morbidity as is shown by the epidemic in Toronto, and also that of Kingston-on-Hull where there were 18,000 cases and no deaths.

A succession of cases in the same house is repeatedly mentioned; and from this fact I believe that diarrhœa also should be classed as an infectious disease. When we have a localized epidemic with a well-defined cause, such as an imperfect sanitary pipe, we cannot say that those cases are infectious, neither can we deny the possibility that some one of the cases will take on a specific character owing to conditions, bacteriological no doubt, as yet undiscovered. There are plenty of cases of diarrhœa which do not infect other people because reasonable cleanliness is exercised; but since we do not know when an epidemic threatens us, therefore, the precautions against infection should be practiced always.

The offensive odor, smell or stench of the stools is repeatedly noted, and leads one to ask: Is there infection in these emanations? Can the nurse or doctor be infected by inhaling these, or by "getting a mouthful of it," as is vulgarly said? Can a healthy person, or one who is a little out of sorts "catch" diarrhœa by using a closet soon after a diarrhœa patient?

I do not wish to confound dysentery with diarrhœa, but an epidemic of dysentery which occurred at the almshouse, Blackwell's Isle, New York, during June, 1886, is a case in point. It was traced to a closet "in a filthy condition," having a "a very bad stench, almost intolerable"; only those using this closet were attacked.

Investigations reported from John Hopkins Hospital show that the *amœbæ coli* are found in all cases of dysentery, especially in the ulcers, and that they "probably reach the intestines through the food

or drink"; but the epidemic at Blackwell's Isle was not the result of contaminated food, it was by the patients inhaling emanations from the filthy closet. Therefore we must conclude that the *amœbæ coli* became sufficiently dried to be air-borne and that the patients inhaled them, or else that the *amœbæ coli* attached themselves to the mucous membrane at the anus and worked back up the bowel. The infectiousness of the emanations from the stools is a delicate subject to enquire into, but it is worthy paying attention to if we wish to protect the healthy from the sick; and outbreaks have happened when there was no communication between cases but the use of the same closet, and that closet one of water-flushed crockery bowls. Koch has said that micro-organisms do not rise off damp surfaces, yet if diarrhœa is caused by these emanations there must be infection therein. We have the cases of mother and son, husband and wife taking diarrhœa successively. We have the case of Dr. Johnston being attacked five times whilst making microscopic examinations. Now I could understand a man being careless or uncleanly three times, but five times seems to me to indicate some mode of infection beyond the control of one who is careful. We have numerous cases of diarrhœa amongst the London doctors; we have the numerous epidemics of cholera-infantum in children's *Homes* where strict cleanliness is not observed with regard to the napkins, the emanations therefrom contaminating the air and giving rise to fresh cases. All these go to show that the emanations are dangerous and that the stools should be disinfected.

Both before and during epidemics of cholera and typhoid fever diarrhœa cases are prevalent, and it is only with the microscope that an absolute diagnosis can be made. Clinically there are cases of choleraic diarrhœa not to be distinguished from cholera. Is it possible that the organism which produces specific diarrhœa is related to the cholera spirillum, and that under favorable conditions a generation will be developed which are cholera spirillum? The clinical facts point that way. The *bacillus coli communis* has been isolated by several workers. It was found to be very numerous in the lower part of the intestine. When injected into the veins of rabbits and guinea pigs it killed these animals with symptoms of violent diarrhœa and fever.

In culture made from a case during the Toronto epidemic Mr. J. J. Mackenzie found only the *bacillus coli communis*. No opportunity offered of further investigation.

The *bacillus coli communis* has its normal habitat in the intestine, and if it is the immediate cause of diarrhœa, we have yet to discover that it is in impure air, in foul water, and in decaying animal and vegetable matter which causes this bacillus to take on pathogenic action.

In August, 1884, a case of cholera nostras; the patient had been repairing a well. In June 1890, another case of cholera nostras, the patient being employed emptying a dead well. From these cases no others seem to have followed, but very serious results, and indeed an epidemic might take its starting point thus.

In August, 1884, 100 cases of choleraic diarrhœa reported with only one death, the cause being potted meat. This same cause or canned meat of some sort has often been noted.

In July, 1885, there occurred an epidemic of choleraic diarrhœa which was attributed to the emanations from refuse and manure standing at a railway siding, among which was much filth and offal of cattle which had died from an epidemic disease. The epidemic ceased when this filth was removed.

THE DANGER OF A SMALL-POX EPIDEMIC.

By P. H. Bryce, MA., M.D., Toronto, Secretary Provincial Board of Health.

Mr. President and Gentlemen of the Association,—In making some remarks on the subject laid down on the programme, I do not propose to discuss small-pox as a disease. It is enough for us to remember the nature of the disease and the history of its ravages to make us consider seriously any possibility of the disease re-appearing in Ontario. To realize what we have escaped during the past ten years in the Province, it may be stated that since 1882 there have been in the Province but 147 deaths, and in the last semi decade only 16, or in the whole period only 107 in every 1,000 of the population. The alarm which a single case causes in any town, the actual cost of caring for it, and the incidental loss in business to any town where the disease appears, are too well remembered not to make us consider carefully any dangers which may exist of the disease making a foothold in the Province. In discussing the possibilities of such an occurrence there are two points which come under our consideration.

1. *The first of these is the fact that there has been and is a general neglect of vaccination of children.* During the great Montreal epidemic of 1885, the general alarm made health boards in all parts of the Province most active in carrying out the law relating to public vaccination. I have no statistics enabling me to state exactly the number of vaccinations performed, but from the partial knowledge in my possession, I think that at least 250,000 persons were vaccinated that year. Including adults it is probable that a still more considerable number were protected by the operation.

Since that year there have been nearly 300,000 children born. Allowing for the usual number of deaths each year, it is apparent that with 600,000 of a school population under 21 years of age, of whom nearly one-third were not born in 1885, and adding to this the children under school age, we have probably some 400,000 persons who come within the class of the possibly unvaccinated. While it is true that in some of our cities the law making the vaccination of children

before entering school compulsory is carried out, yet from my knowledge of the operations of school boards and boards of health in the different parts of the Province, I am convinced that the Vaccination Act is honored rather in the breach than in its observance. The reasons for this are several: (1) because its compulsory operations are left to the will of the local boards and councils, its compulsory provisions from a provincial standpoint dealing only with the presence of actual disease; (2) to the absence of any outbreak of the disease serious enough to cause general alarm, thereby preventing boards from feeling the necessity for enforcing a law, the machinery of which causes some little expense and a certain opposition on the part of the public who are apathetic in the absence of danger, and (3) to a belief not expressed in words, but producing its effects in action, that, from the few outbreaks during the last eight years, and the readiness with which they have been suppressed, general and systematic infant vaccination is not a necessity.

With regard to the existence of this latter opinion I desire to make one or two remarks. Of course it is evident to all, that if the disease be not introduced vaccination is not required. But assuming that it may be at any time, are we in a position from past experience to believe that the time given us for vaccination in any community, before too many centres have been established, is enough to prevent a serious epidemic from occurring? If I were to speak from the standpoint of our experience, I might be inclined to say that this time is enough. But there is one factor which has come into operation during this period which must make any such conclusion based on experience more or less fallacious, viz., the fact that the greater existence of small-pox up to 1880, before local health organizations existed, and before isolation and disinfection were practiced as thoroughly as at present, caused the people generally, I believe, to pay greater attention to the vaccination of their children than at present. If this be true, then it is evident that we are rearing a population, with a larger yearly proportion of unvaccinated persons, thereby making a constantly larger explosive ratio in the matter of exposure to the disease.

We have an additional factor, due to the fact that the number of medical practitioners who have never seen small-pox and who are therefore liable to make a mistaken diagnosis is yearly increasing.

Again, we have another factor of increased danger in the growth of town populations, thereby creating conditions which, as seen to-day in England, in spite of compulsory vaccination, are the apparent reason for the very serious epidemic of small-pox in that country. While it may be said that if the population is increasing, the efficiency of our Local Boards of Health increases to a still greater degree, yet it can hardly be said that in this latter regard we are more advanced than those in England. Most are, moreover, aware that now vaccination in Leicester has, with the best of isolation, proved a serious failure. It therefore appears to me too serious a responsibility, to conclude from our fortunate experience to-day, based on the history of ten years, that it is safe for us to depend upon our organizations and ability to deal with outbreaks when they occur, and to depart from the historic methods which have freed continental countries so largely from the ravages of this loathsome disease.

This reference to continental countries naturally causes me to refer to the second point I referred to as requiring our consideration.

2. *The existence of small-pox in Europe and Asia.* Till very recent years we had to look for danger only in one direction, viz., from European immigration. To-day we have in Asia another direct source of danger. I have only to remind you of the very serious outbreak of small-pox which spread over British Columbia last year, several outbreaks therefrom being caused in the North-west and reaching even to Port Arthur. Fortunately it came no further. But while not forgetting this, it may be said that the great distance from the western coast and the fact of there being practically but one direct line of railway communication, enables us to be forewarned before its appearance in our centres of population.

We then must turn our eyes eastward as hitherto, and examine the probable sources of danger. For years past there have come from Europe more than 500,000 immigrants to the United States or Canadian ports. These come from Great Britain, Germany, Sweden, etc.

At present small-pox exists seriously in 50 English cities, and in important towns in Sweden. Are we being protected from these sources of danger? Several years ago vaccination of all immigrants to Canadian ports was, by our quarantine regulations, made compulsory; but the same system not being operative for American ports

the order has been rescinded One result of the neglect of the order has been seen this season. Most of you have seen the facts as published. One ship brought several infected persons to Halifax. No vaccination had been practiced on ship-board or in Europe. Several cases of sickness occurred, if not on ship-board then immediately afterwards. By the time these immigrants had reached Port Arthur the eruption was well developed, the contagion being great enough to infect one French-Canadian who took passage at Ottawa, and who subsequently sickened at Port Arthur. One child died before the train reached Winnipeg. Some twenty cases in all were the result of this infection, distributed at Fort William, Rat Portage and Winnipeg, and three small-pox camps were established. Had these cases not been so far advanced as to force the railway officials to report them, there is little doubt but that several hundred unvaccinated and exposed persons would have been distributed to many points in Manitoba and Dakota, instead of being completely quarantined, with results not pleasant to contemplate.

The same thing may happen at any moment with the discontinuance of the wise precautions adopted after the Montreal outbreak.

Many outbreaks in different States of the Union have been reported during the last eight months; and a quarantine camp, having at one time probably 1,500 persons, still continues at New York.

In view of these facts, and the neglect of vaccination already referred to, it appears to me that the Association is forced to conclude:

First, that general vaccination before the entrance of our children to schools is a public necessity; and

Second, That the quarantine authorities should be petitioned to inforce a new order for the vaccination, either before embarkation or on ship-board, of all immigrants, and for the inspection, and in cases of neglect, of the vaccination at quarantine of all immigrants arriving at Canadian ports.

HOW TO PURCHASE SAFE DAIRY COWS.

By J. H. Reed, Esq., V.S., Guelph, Lecturer Agricultural College.

Mr. President and Gentlemen,—The purchase of safe dairy cows, that is cows whose milk is wholesome food for the human family, is a matter of great importance. It is also a very difficult matter—one in which the most careful and skilful purchaser may make a mistake, for the following reasons: Any cow affected with or predisposed to any contagious disease is not fit for dairy purposes, as not only is there a danger of the disease being communicated to other cows, but the milk of cows suffering from some contagious diseases is liable to produce the same or a similar disease in persons consuming it, especially in children or grown people of weak constitution. It is difficult to purchase dairy cows with surety of safety, from the fact that some of those diseases are so insidious in their early symptoms, or, I might say, absence of symptoms, that it is impossible for any man to diagnose them. In order to purchase cows with all possible degrees of safety, it is necessary that the purchaser have a thorough knowledge of the symptoms to be looked for from such diseases, and if there be an absence of any suspicious symptoms, he must enquire about the animal's antecedents, and ascertain, if possible, if any of them, on either sire's or dam's side, have been affected with any disease. If the seller be known to be an honorable, straight dealing man, one on whose word dependence can be placed, and he has bred the animal, of course his word will have great weight. If all enquiries be favorable, and there be no suspicious symptoms of existing disease, and the history and pedigree of the animal do not point to hereditary tendency, the animal may be purchased with all possible safety.

The principal diseases in which the milk is injurious are:

Cattle plague, pleuro-pneumonia, foot-and-mouth disease, anthrax, rabies, tuberculosis, actinomycosis.

Cattle plague: This is a febrile and highly contagious disease affecting the bovine species, and capable of transmission to all ruminants. It has never been seen in America, and in Europe only as an imported and purely contagious malady.

Pleuro-pneumonia contagiosus : It is a specific contagious disease peculiar to the bovine species. It has as yet not been seen in Canada. The first symptoms are an increase of temperature; this may be the only symptom shown for five or six weeks. Under 100° may be considered healthy, above that and under 102° they should be viewed with suspicion, above 102° or 103° they are diseased. The first noticeable indication is a less keen appetite than usual, slower rumination, and the emission at rare intervals of a slight, weak, dry, short cough of a peculiar character, generally heard in the morning after drinking, and when the animal rises or leaves the stable. Later the cough is more frequent, dull, harsh, and painful, and in coughing the back is arched and the head and neck extended. These symptoms may persist for weeks, and may be overlooked. The respirations next become quickened (25 to 30 instead of about 15 per min.), and gradually somewhat labored, accompanied by distension of the nostrils and heaving of the flanks. The hair loses its lustre and stands erect in places; the gums have a pale lilac hue. The walls of the chest and back, from the withers to the loins, are usually more sensible to pressure than normal, particularly in the spaces between the ribs. The appetite and secretion of milk diminish, a discharge takes place from the nostrils, and the temperature, especially at the ears and horns, is liable to variations. If auscultation be practised, it is usual to discover a change in the respiratory sounds (in two-thirds of the cases in the left lung especially), more particularly towards the lower part, increasing slowly in extent and intensity. This change is due to the air cells becoming filled as it were, and impermeable to the air, along with alteration of the lining membrane of the cavity. Later the febrile symptoms become more marked, according to the extent of the morbid changes and the irritability of the animal. The pulse is quickened to 60 or 70 beats per minute, the heart's beats indistinct, the muzzle is dry, the horns and ears hot and cold alternately. Sometimes shivering fits are noticed. Appetite and rumination completely disappear. The fæces are rarely morbid, and the urine is scanty and high-colored. Drinking is difficult and excites coughing, while the secretion of milk is nearly or entirely suppressed. The animal stands with the fore legs wide apart, often changes the position of the hind legs, and seldom or never lies down. Progression is difficult and

unsteady, the respiration more hurried and labored, with greater expansion of the nostrils and heaving of the flanks; moans and grunts accompany the respiratory movements, and in many instances the whole body shakes with the effort made to breathe. The cough increases in frequency, huskiness and painfulness, and pressure on the chest causes great pain. Auscultation and percussion testify to extensive alterations of the lungs and the cavity of the thorax. At this stage death is the inevitable termination. As to the danger of consuming the milk of cows affected with contagious pleuro-pneumonia, opinions differ, but an animal so affected would certainly not be safe for dairy purposes.

Foot-and-mouth disease: This has been seen in Canada, being introduced by diseased cattle brought from England. It is characterized by an eruption or vesicles of blister in the mouth and the internal surface of the lips, sometimes in the nostrils and on parts of the body where the skin is thin, on the udder and between the claws. It passes through the definite stages, which may be best described separately, as they form the group of symptoms by which the disease may be recognized. These phases may be reckoned as four: Fever, eruption, ulceration and desiccation.

First, before any alteration has taken place in the ordinary habits or condition of the animal, there is an increase of temperature, which gradually ascends to 102° or even as high as 107° in from one to three days, and does not descend to any extent until the end of the eruptive period. The next indication is dulness, want of appetite and slight shivering. The muzzle becomes warm and dry, tears flow from the eyes, and the mouth is hot and inflamed in places, and usually sore when handled, the membrane being covered with viscid mucus, which flows in stringy masses from the mouth. There is grinding of the teeth and a peculiar smacking noise, the breath has a fœtid odor, rumination ceases, prehension and often deglutition of food is painful, the animal preferring to dabble its mouth in cold water. Not infrequently, when the feet are beginning to inflame, the animal stands uncomfortably, drawing the limbs together, standing uneasy, or jerking them up suddenly under the body, arching the back and pawing; the movements are reluctantly performed, and the coronets are hot and sore. There is also slight constipation, and the secretion of milk is gradually diminished, and

that fluid assumes a yellow tint. When the udder is morbid it becomes hot and tense, and the teats smaller and painful to the touch. This stage usually lasts from 24 to 48 hours, according to the intensity of the fever.

Second, eruptions begin to appear in those parts which are to be its seat, and in many cases the fever begins to abate. When the mouth is chiefly affected there are seen on its lining membrane, particularly on the upper lip, gums and sides of the tongue and palate, whitish blisters the size of a grain of millet to that of a pea or nut, their form being very irregular. They may be scattered over the surface or collected in patches. They exist only for a short period, the friction taking place by the movements of the tongue tearing them, the epethelium is detached in flakes, leaving unhealthy ulcers, or denuded spots of a bright red tint. Where there is no friction the vesicles do not rupture for one or two days. On the udder the vesicles are somewhat different. The teats are most frequently their seat, and it is not unusual to find them grouped in a circle around their orifice; when isolated on the surface of the organ, they are surrounded by a pale red circle, and when confluent they are very irregular and variable in number. When the limbs are affected, the heat and redness of the coronet are more notable towards the heels and the interdigital space of one or more feet. The coronet swells, the animal is lame and generally lies a great deal. In a day or two the vesicles are developed at the points indicated. At first they are small, but increase in size until they are as large as a bean or small nut, and extend around the claws, often becoming confluent, the contents appearing a yellow, limpid fluid. The skin of the part assumes a blanched aspect, and is soon covered by a kind of cheesy matter. In some cases the skin around the roots of the horns becomes inflamed at the same time as the mouth and feet, and the horns are loosened. Occasionally, also, a vascular eruption takes place at the orifice of the vagina, at the perineum and anus, or in the nostrils, and the eyes are sometimes attacked.

Third, the vesicles have ruptured, and the epidermis being removed, erosions appear. This does not occur everywhere at the same time, but varies according to the region. In the mouth it soon occurs, owing to the movements of the tongue, and also in the

feet, by that of the claws, on the udder it is later. It sometimes happens that when the tongue is seized to examine the mouth, large patches of epidermis come away in the hand, as if the tongue had been boiled. The fever has greatly subsided, but the thirst is intense, and the animal eagerly drinks water or gruel, though, owing to the soreness of the mouth, it can eat but little, especially if the food be dry and hard.

Fourth, this is marked by a desiccation or drying up of the aphthæ and the formation of new epidermis. The crust falls off and the new epidermis or epithelium appears as a thin lead-colored pellicle. With the completion of this process all traces of the disease disappear. There is no loudness, the appetite returns and the lost condition is restored, while the secretion of milk regains its normal properties.

The milk of an animal suffering from this disease is undoubtedly unfit for food.

Anthrax: This may almost be said to be a universal disease attacking mostly all animals, even birds and fishes, but solipeds and ruminants, especially ruminants appear to be the most pre-disposed to it. It is a constitutional disease, appearing in all climates. It is an acute blood disorder of a septic nature. The symptoms in the animal vary according as the disease runs its course as a general, localized, or non-localized blood disease. In the first, death is usually very rapid, while in the others, besides the symptoms due to alteration of the blood, there are those also occasioned by the disturbance of the circulation and local nutrition. The first form, the true type of the disease, is called splenic apoplexy or anthrax fever. The second is characterized by the localization of blood and exudates in various tissues and organs, and is called "carbuncular" or "anthracoid erysipelas." It affects cattle in its various forms. Splenic apoplexy is characterized by its extremely rapid course. The animals suddenly fall and die in a few minutes in the midst of convulsions, a blood-colored foam escaping from the mouth and nostrils. It is not at all uncommon to find animals, which appeared to be in perfect health the previous evening, dead in the morning. In some cases, however, the course of the malady is less rapid. There is a cessation of rumination and loss of appetite, weakness and prostration ensue, with stupor or great excitement, shivering and general or partial

sweatings appear, or the skin is hot and cold alternately, pressure along the spine and the ribs causes pain, the muscles in some regions, especially that of the neck, contract spasmodically, and these contractions are often accompanied by plaintive lowing. If the animal be made to move, it staggers and stumbles, often falls and has difficulty in rising. Diarrhœa of a fœtid character sets in and there is abdominal pain. The pulse is small, quick and irregular, there is well marked stupor and the eye has a dull, dead appearance, the legs and face are cold, though the temperature of the body may be high, the respirations are labored and panting, the muzzle dry and the mouth filled with foamy saliva, the tongue is pendant and violet colored and the animal grinds its teeth, the abdomen becomes distended, the animal falls, bloody foam flows from the mouth and nostrils, and convulsions commence. Death usually results in from two to thirty-six hours.

Localized anthrax is characterized by an eruption of vesicles on the dorsal surface, at the base, sides and along the frænum of the tongue, on the gums, palate and inner aspect of the lips, their appearance being seldom accompanied by fever. The vesicles are at first white and translucent, but soon change to a grey, yellow, violet and a blackish disagreeable color. They increase rapidly in size and may become as large as a hen's egg. The tongue swells and becomes pendant, and assumes a bluish or black hue. The vesicles rupture and discharge an acid, corrosive fluid, leaving ragged ulcers, red in the centre and black around their margins. The tumefaction attacks the lips and cheeks and reaches the base of the tongue, pharynx, larynx and soft palate and the creature may die of asphyxia, if not of the disease itself, in a few hours.

The third form of anthrax "carbuncular fever" is characterized by the appearance of tumors on different parts of the body, such as the back, sides, a hind limb, the breast, neck, dewlap and elsewhere. They are accompanied by well-marked fever. Small at first, these tumors rapidly increase in size and often attain an enormous size. When they begin to develop, they are hot and painful, but soon become cold and indolent. When cut into they are found to be composed of a firmly coagulated, yellow exudat, mixed with numerous black, bloody masses; the skin covering them is dry and cracking. The tumors sometimes open spontaneously and a black, blood-colored

viscid fluid escapes. Recovery sometimes takes place from this form of anthrax.

Death usually results so quickly from anthrax that there is little danger of milk from affected cows being consumed. And if the disease does not cause death quickly the appearance of the milk "which is of a dirty bluish color" should alone lead to its condemnation.

Rabies or hydrophobia: This is characterized in the cow by loss of, or depraved appetite, prostration, great restlessness, increased excitability, muscular tremblings, saliva flowing from the mouth, exaltation of the sexual desires, difficulty in swallowing. During the paroxysms the eyes are staring, brilliant, haggard-looking and injected, and the pupils dilated, the mouth hot and foamy and the voice dull and hoarse. The animal is very excited, bellows frequently, agitates the jaws, paws with the fore-feet, falls down, rolls about and tries to break away from its fastenings. Frequently there is evinced an aggressive disposition, they strike with their horns or their foreheads, with such force that the horns are often fractured. They rarely attempt to bite. Appetite is lost and rumination ceases. Emaciation becomes extreme and at length paralysis of the posterior extremities ensues. Then the animal remains recumbent, and perishes in a state of profound coma. There is no evidence to show that there is any danger in utilizing the milk before the symptoms of the disease appear, but it would be most injudicious to use it after the malady is developed.

Tuberculosis: I consider this the most dangerous disease of all in regard to milch cows, as on account of its insidiousness it may be present in an animal for a long time without showing any well marked diagnostic symptoms, and at the same time there is little, if any, doubt that the milk is unfit for food for either the human family or other animals. It is a disease of malnutrition and mal-assimilation. Experiments have shown that it can be produced by inoculating or feeding animals with the morbid product. The disease may affect almost any organ and the symptoms depend on the extent of disease and the organ or organs affected. The progress is sometimes acute, but is most frequently chronic. And the symptoms in the milder cases are not always well defined. The insidiousness of the malady at its commencement renders its primary phenomena obscure and

unnoticeable, and the disease may have been in existence for months before any external symptoms can be noticed. Often when an animal "that appeared perfectly healthy" is slaughtered we are surprised to find tubercular deposits in some internal organ. The pleuræ and lungs appear to be the favorite seat; usually, but not always, there is more or less of an increase in temperature, even before any symptoms are noticed. If the lungs be affected there will generally be emitted a dry, deep cough at intervals. This condition may exist for months, or possibly for years, and the animal in the meantime thrive fairly well and yield a fair amount of milk. In other cases the disease takes on a quicker course, the cough increases in frequency and pain and is easily reduced by exercise, excitement or pressure on the trachea, auscultation reveals an alteration in the lung structure, the respirations become short, quick and labored, appetite and rumination are impaired, emaciation soon sets in, and if the animal be not slaughtered death will ere long end the scene.

If the intestines be the seat of the disease, the symptoms will depend to a great extent on the particular part or parts involved. Usually there is irregular digestion, diarrhœa and constipation appearing alternately, appetite is also usually irregular or capricious, so also is rumination. As the disease advances the symptoms increase, emaciation and death follow. The udder or in fact any of the glands may be involved. Muscular tuberculosis is occasionally met with, in which case the deposits can usually be felt by the hand. In these cases there will be no constitutional symptoms shown, at least for a time. The brain is also in some cases the seat of the trouble, in which cases there will be more or less well marked symptoms of brain trouble. There is no doubt in my mind that the use of milk from a tubercular cow is attended with great risk. It is claimed that unless the udder or lacteal apparatus be affected, there is no danger. On this point opinions differ. (Gave history of calf slaughtered in April.)

Osteo-sarcoma or actinomycosis: This is characterized by an osseous tumor on either upper or lower jaw, now generally acknowledged to be due to a scrofulous diathesis or hereditary predisposition. Therefore we could not consider an animal affected with or pre-disposed to the disease a safe dairy cow.

In order to purchase dairy cows with all possible degrees of safety, a person must examine carefully for symptoms of any of the diseases mentioned, (in fact for any disease) and enquire about the antecedents of the animals. If there be absence of all suspicious symptoms and all enquiries be favorable he should use the thermometer and reject all cows that registered over 100°. It would also be good practice to excite the animal or cause her to jump over a fence or something of that nature, and if the excitment or exercise caused her to cough he should reject her.

DEFENCES OF THE PROVINCE AGAINST CHOLERA.

By John Coventry, M.D., Windsor, Medical Health Officer.

Mr. President and Gentlemen: I have been requested to open the discussion on "The Defences of the Province against Cholera." In doing so I do not see the necessity of reading an elaborate paper giving the history of the disease or its ravages. These are matters of record. So are the avenues of invasion. The highways are the same, but some of the conditions are changed. The halting places are fewer, distance is well nigh annihilated, and an army, more or less effectually equipped, lies in wait for the arrival of the enemy.

In some respects our danger is increased. Emigration agents are very active among dense populations, offering reduced rates to European passengers; and the semi-serf of Eastern Europe, with a skip and a bound, plants himself on your doorstep a full-fledged pauper, with a fur overcoat, but minus a shirt. His meagre trousseau is a subject for congratulation to the Health Officer, because the fewer duds he carries the less danger there is of their conveying cholera. Severe inspection at New York has sent a larger number of immigrants to our own seaboard from Europe, and now that we are in weekly communication with Japan, China and India, we have a rear to protect as well as a front. Small-pox has gained a foothold from this direction, and it is altogether likely that cholera may do the same. But to my mind the most likely points for invasion of Ontario from cholera and other contagious diseases are Windsor, Sarnia and Sault Ste. Marie, where trains are delayed by Michigan inspectors who stop all trains from New York and Montreal alike, delaying the passengers for days. Many of these people are without food or money to buy it with. They drink from the water at the docks which you all know is foul and will produce disease. They are cuddled together in cars where they sleep in less than 30 cubic feet of space to each passenger. When these cars are in motion the air is changed, but sidetracked down by the water's edge on a sultry summer night, sandwiched in between long rows of cattle cars, visions arise of the black hole of Calcutta.

These people, whether from New York or Montreal, carry all the certificates required by the United States Marine Hospital Service, which is the recognized authority of the Washington Government. But the Michigan State Board of Health is subject to periodical attacks of super-erogation, and although they have never provided themselves with quarantine grounds or disinfecting apparatus, they obstruct traffic, delay passengers, endanger the lives of travellers, establish breeding-beds for disease, and bring the Health Officer, as an agency for conserving the public health, into contempt. To my mind the Atlantic and Pacific seaboards are the only national lines of defence. The Federal governments of Canada and the United States should be specially charged with this duty, and the inspection should be made *real* and not nominal as it has been in the past. But I fear that politics have been permitted to influence the powers at Ottawa and Toronto, at Washington and Lansing, as well as other places, and that there are not the cordial relations which should always exist between scientific men whether Federal, Provincial or State. After having defended the country at the coast, should isolated cases elude the vigilance of quarantine, then let them be dealt with by the municipality where the disease develops, the Provincial or State Boards lending such assistance as the Local Board may require to cope with the situation. This anticipates a thorough inspection of municipal health organizations, by Provincial Boards at points most liable to attack.

But I view a quarantine established by one Province against another, or one State against another, or a State against a Province, as I would the imposition of duties against each other's manufactures, or against the products of each other's fields.

In order that this arrangement may be practically carried out let the Provinces of Canada ask the Dominion Government to place reliable and experienced officers at ocean ports of entry, furnished with such equipments as will enable them to render immigrants and their effects harmless, and let all Local Boards of Health recognize certificates issued at Marine Quarantine, and allow passengers to proceed to their destination with as little delay as possible.

The same arrangement should prevail in the United States, all States recognizing the Federal certificate, and, if politics are only eschewed, quarantine officers will do their duty.

Coming down to the possibility of a case of cholera developing in our midst, let me ask the question, "What are we going to do about it?" It is just well enough for every Health Officer to apply the hypothetical question to himself and quietly think out the question of dealing with it. No rule can be laid down for all to follow. The circumstances and surroundings must decide that. Isolation should be secured as a primary step. If the patient cannot be removed the rest of the family should leave. No communication with the outside public should be allowed except through the medical attendants and nurses, and these only after taking the most scrupulous precautions.

The lavish use of disinfectants, should begin, continue, and only end when undoubted convalescence has taken place. Early detection of the disease, followed by prompt isolation and thorough disinfection, including every halting place where the patient may have rested or left a trace of the disease should be striven for. The king of disinfectants is the bichloride of mercury, and as it has no smell it gives no offence. In the proportion of one grain to four ounces of water it is the "Camperdown" of the Health Officer.

The treatment of cholera does not come within the compass of this paper. I have left much unsaid which might profitably have been dwelt on, but the foregoing will serve to introduce the subject for discussion.

THE PUBLIC HEALTH ACT IN RURAL DISTRICTS.

By H. S. Martin, M. D., Erin.

Mr. President and Members of this Association,—In responding to your invitation to prepare a short paper for this meeting, I have endeavored to touch briefly upon some of the defects of our present Health Act, as applied to rural districts. I trust, should I be fortunate enough to get any discussion upon this paper, that some of the questions, whose borders I have merely touched, may be profitably developed.

The law is unwieldy, and its machinery too complicated for successful application in country places. A four-horse plow is an excellent implement for tilling the soil, but apply it alike to the prairie farm and the cottar's garden, and its deficiencies appear. So health regulations, admirably suited for large centres and populous towns, are too cumbersome to be successfully adopted in smaller villages, and the country generally. We have sanitary inspectors, medical health officers, and local health boards in most municipalities. These rural sanitary inspectors, with whom the initial responsibility of estimating nuisances, causes of outbreaks of diseases, etc., rests, are, in most cases, deplorably incompetent. In cities and towns, where the work and compensation are sufficient to command intelligence, knowledge and experience, this system doubtless works better. The rural estimate of a Sanitary Inspector's duties is not very exacting, and his remuneration is, of course, fixed according to this standard. He earns his pittance as quickly, and as easily, as possible. The health of his inspectorate, if he has even a rudimentary conception of what this means, is very secondary to his anxiety to escape the ill will of those whose premises he is supposed to inspect. Is not this official in very many cases appointed at the instigation of the Medical Health Officer, to perform such duties as he considers somewhat *infra dig?* A sort of scape-goat for the Local Board of Health, and the Medical Health Officer. I know of one instance where a sanitary inspector, on his annual round, visited certain premises, upon which was a closet constructed on the dry earth system. It contained nothing, excepting a box of fresh wood ashes and a little chloride of lime. This latter was evidently offensive to his sensitive

nostrils, as he ordered the proprietor to have it (the closet) cleaned and thoroughly disinfected within twenty-four hours, and reported his place amongst those found in an unhealthy condition. The next year, when the same official visited the same premises, there was a pig kept within thirty feet of the dwelling house, and between twenty and thirty wagon loads of manure rotting in the stable yard ; but everything was reported in first-class order. This Inspector is a fair specimen of those to whom the most important part of country sanitation is entrusted.

I am loath and sorry to state that our medical health officers are only a slight remove, if any better than our sanitary inspectors, the main difference being, that indifference in the former takes the place of ignorance in the latter. I practiced six years in the country before I saw either a placard, or a blank form on which to report contagious cases, or was even asked to make any report of contagious cases, their death or recovery. Do not infer from this that we were indifferent to the spread of disease. We did the same then as now, minus the formalities. How these health officers made out their elaborate reports I cannot tell. It is quite probable they were incorrect and incomplete. While the present Health Act is in force we are not likely to profit much by the appointment of medical health officers, or to suffer much from their non-existence, outside of populous centres. In fact, the Act will protect them to the extent of making themselves veritable officious nuisances, and, at the same time, with a sanitary inspector on one side, and a Local Board of Health on the other, it is difficult to locate their responsibility. I once saw a medical health officer visit two houses, which he had only a few days before placarded for diphtheria, and before changing his clothing or making any attempt at disinfection, call to see other patients and enter places open for public business. I remember another medical health officer, visiting a house in which a child had died the day before from diphtheria. The people were in the midst of cleaning and disinfecting, shaking carpets, curtains, bedding, etc., yet after examining the house he went direct to the hotel, thence to a public meeting, where he made loud complaint against the attending physician because he had allowed the corpse to be buried before he was notified. In this case the body was wrapped in saturated sheets and buried according to the latest regulations regarding death

from this disease. Such sanitary inspectors, and such medical health officers, are not always helpful in stamping out contagious diseases.

Even if we could be assured that the most competent and most conscientious sanitarian in the municipality would be selected as medical health officer, and had the further guarantee that he would accept the appointment, it would still be impossible to have the present Act carried out. Does it not seem ridiculous that this opportunity of all our local health officers is left in the hands of those, who in most cases do not possess the slightest knowledge of even the most elementary principles of sanitation and public health?—four or five burly agriculturists whose whole knowledge of diseases may be limited to a case or two of cucumber cramps. These municipal councillors, by whom these appointments are made, may be, and doubtless usually are, the very best men in the district to fill the positions to which they are elected, but they are chosen because of their fitness to look after contracts on ditches, roads and bridges and keep down the municipal tax bill. Not one thought is given to their ability to select a good and efficient board of health, medical health officer, or sanitary inspector. Under these circumstances the medical health officer is likely to be the local practitioner who takes the most active part, and has the most influence in municipal politics, or the medical man who will pledge himself to run matters of public health on a basis not likely to draw too heavily on the municipal treasury. When we consider how these officers are appointed, and the miserable pittance usually allowed for services rendered, it is not matter for wonder when their duties are neglected, and their annual reports œdematous. Dr. P. H. Bryce spoke as follows before this Association last year at Niagara Falls:—"The Medical Health officer if paid at all is not paid sufficiently, and it is not to be expected that such an officer who feels that his term may be shortened by so doing, is going to make enemies who will try to put him out of office if he attempt to do good work." It is surely a serious reflection upon our present law, when the leading Health Officer of this Province, a man above all others in position to pass judgment upon the work of local medical health officers, has to admit that their risk of deposition is in direct proportion to their efficiency. Would the

public tolerate a law of that kind in any matter apart from public health? If we must not expect our medical health officers to do their duty under the law as it now stands, let us by all means change that law or abolish it. If we are not to have good work at the hands of health officials because they stand in dread of those by whom they are appointed, it reflects alike upon those making the appointments, and the law under which these appointments are made. This work of sanitary inspection should be carried on by officers of a different type from those now entrusted with the work, and these men should get their appointments and compensation from some source independent of those they have to inspect. The Government appoint and pay properly equipped men to inspect hotels, post offices, weights and measures, schools, fisheries, etc., where the results of fraud or neglect could only result in a short-lived loss of money or money value which would soon correct itself in the keen commercial competition. But in the all important matter of public health, where carelessness or error lead to suffering and loss of life, a most astonishing indifference prevails.

What we want are sanitary inspectors fearless and competent, well paid by Government and well sustained by concise, definite regulations placed in the hands of our country people. These inspectors should be required to take a special course in sanitary science and all its branches relating to sewerage, water supply, ventilation, etc. They should have a good knowledge of the general causes of diseases, more especially those arising from the various forms of bacteria and malarial influences. They should also possess sufficient knowledge of the diseases of domestic animals to enable them to diagnose and prevent the spread of those dangerous to the human family, particularly those to which milch cows are liable. Any of our good central educational institutions could easily be induced to establish a department to train such men for such work. One such inspector thoroughly educated up to his duties and well equipped for his position could do the work now so recklessly left to a great number of these unqualified local inspectors without adding materially, if at all, to the expense. By allowing one of these officers to take the duties of sanitary inspectors, medical health officers, and a greater part of those now entrusted to Local Boards of Health, in a considerable district of territory—say

the extent gone over by a public school inspector, for example—we would have infinitely better sanitary attention at a trifling increase in cost. I believe in many districts this system would be less costly than that now in vogue. These men could not be handicapped in the various ways our present inspectors and medical health officers are. At present, if a ratepayer complains of some miasmatic boghole in his vicinity our sanitary inspector is notified. He waits for a leisure afternoon and goes out with his best clothes and scientifically deliberates. After due consideration he reports to his board of health or health officer. In a certain locality "there is a bad hole, and it *stinks*." The danger is estimated on the *stink*. His knowledge is not sufficient to properly estimate the evil or suggest any remedy. On the other hand, an enlightened inspector such as I have referred to could take the matter in hand intelligently, pass judgment upon what amount of evil may arise from the nuisance, suggest practical and efficient means for its removal or remedy, and this without calling in the costly services of a medical health officer or calling half a dozen meetings of the Local Board, and finally referring it to the Provincial Health authorities to escape the antipathy of some good friendly patient or influential voter on whose premises the nuisance may exist. Intelligent ratepayers who regard the present system of inspection as a show, or as a municipal expense without adequate return, would welcome and gladly submit to taxation for some plan that could not fail to commend itself as thorough and beneficial in its results.

Again, the present system leads to unpleasant and frequent entanglements between the local medical health officer and his brother practitioner in the same municipality. All duly registered medical practitioners are recognized *by law* as upon the same level, and none are willing to allow another—often one known to the profession as a second-rate man, set up by a few farmers—to dictate to him how he shall treat his cases of contagious diseases, much less submit to his officious interference with individual patients. The Act now allows a medical health officer to visit a patient being treated by a rival practitioner, say for diphtheria, and declare the disease to be something else. Further, the law says he may call in some friendly pliable doctor to confirm his diagnosis, and thus destroy all confidence the family or neighborhood had in the attending physician. I know of

a case where this occurred, and it was only after the attending physician had spent ten dollars to have the membrane examined and cultures made by two pathologists, and the occurrence of three fresh cases—one in the same house and two immediately across the road—that the suspicion of the local board was aroused and the medical health officer induced to agree with the opinion of the attending physician. These two friendly medical health officers are held by the neighborhood as answerable for the last three cases of diphtheria in those two families. This may not often occur, because there are few health officers who will allow their feelings against a fellow practitioner to lead them so to abuse their powers. But the law should be so constructed that it could *never occur*. By having these duties placed in the hands of an official whose power to hold office, and whose remuneration could in no way depend upon his inspectorate, we would have better chances of thorough efficient work, with much less risk of such disgraceful work as above alluded to. In fact, he would be looked upon as a specialist in an important department of our work, from whom much valuable advice could be had, and who in his turn could receive much information and assistance from the medical men in the different quarters of his field.

There is another aspect in which the present Act seems deficient. It fails to make any allowance to workingmen for isolation, etc., during the existence of contagious disease in their families. If a tuberculous cow is discovered in a man's herd the beast is destroyed, and the Government compensates the owner. That is, the public are taxed for the value of the cow, to the same extent that the public are protected by the slaughter of the animal. This appears only just, and as it should be. But when a working-man's child takes diphtheria he and his sons are immediately confined to the house, his source of income is cut off, or he must desert his family and board and lodge elsewhere, at considerable cost and inconvenience. For this loss and trouble he receives no personal benefit more than the former does for the loss of his cow. In direct proportion to his faithful isolation the neighboring public are protected. It seems but just that a poor man who is unfortunate enough to have diphtheria in his house, and suffers loss for the benefit of the public, should have as good claim on the public treasury as his rich farmer neighbor who lost a miserable phthisical cow

One more point before I close. I wish to draw the attention of this Association to the criminal recklessness some of our city medical men show in sending patients recovering from contagious diseases out to the country to convalesce, more particularly scarlet fever and diphtheria patients. Within the past twelve months we have had three distinct outbreaks of diphtheria in our locality, with four deaths, and each one of these outbreaks has originated from a patient who was allowed to leave the city before he or she was free from the germs of contagion.

SYSTEMS OF SEWERAGES AVAILABLE FOR SMALL TOWNS AND VILLAGES.

ADLAN MACDOUGALL, M. CAN. SOC. C. E., M. INST. C. E., TORONTO.

Mr. President and Gentlemen,—Co-workers and colleagues in the great cause of health, the engineer can readily take his part in the discussions of a conference of medical health officers, presenting his quota of professional knowledge and experience in the solution of the many questions which arise in the great problem of guarding the public health. He can aid his professional brother, the medical practitioner, and obtain for himself undoubted advantages from the experiences of those who are directly battling with disease. How best to provide a cheap and efficient system of sewerage and sewage disposal for some of our small towns, is one of these.

We have in our Province many thriving little communities built on such rocky formations that they are precluded by the excessive cost of laying sewers from undertaking any work of that nature. Some have already at considerable cost constructed waterworks systems from which they are unable to obtain the full advantages from want of a system of sewers. The community enjoys only a portion of its advantages by being supplied from a good safe water supply. It cannot enjoy the full benefit whilst its health is constantly endangered by having no efficient means of disposing of its waste matters.

It has become a necessity all over the civilized world to dispose of human wastes by systems of sewerage. The writer hopes to sketch out a plan whereby a cheap sewerage system can be introduced into many small towns. In designing a sewerage system it is necessary to provide for cellar drainage. To accomplish this it becomes necessary to lay the sewer, at a depth of 9 to 10 feet. The general practice is to lay the sewer in the centre of the street, which causes the house drain or connection to be about 60 feet, making allowances for a fall of 12 to 18 inches on the distance and allowing for the proper height to connect with the sewer, the minimum depth at which the main sewer could be laid would be 8 feet. If much rock is likely to be encountered in laying the sewers it increases the cost, rendering the

price prohibitive to small communities, many of whom will gladly avail themselves of sewerage systems if a plan can be suggested whereby the excessive cost of the orthodox system can be lightened.

We now have at our command much valuable information, obtained after careful and costly research, regarding many problems in sewerage of which we ought to avail ourselves. It can now be accepted as well established that there is sufficient amount of latent heat in sewage to keep it from freezing, even in the coldest weather; the experience of the sewage farms in Germany, Berlin in particular, have placed this beyond question. The extremely carefully conducted investigations by the State Board of Health of Massachusetts, demonstrate that in our climate it is practicable to keep sewage from freezing, and even to prevent the frost from penetrating into the earth. The last report says that when the sand in the filters was frozen solid after draining, there still remained open pores through which the sewage found its way, thawing to some extent the frost as it proceeded. This has been corroborated by experiments made at South Framingham, Mass., on the filter beds; a summary of the results was published a few weeks ago.

The sewage was distributed over a bed of seven-eighths of an acre, which had not received sewage since September, 1892.

On 9th, January, 1893, with 18 in. of frost and 10 in. of snow, temperature 6° F., 300,000 gallons of sewage were pumped; on the 10th, 150,000 were pumped, the underdrain started in 6 hours; on the 11th the frost was almost entirely out in some places; on the 12th the sewage had entirely disappeared, temperature of sewage 50°; on the 16th 500,000 gallons were pumped on a bed of one acre, the sewage temperature was 49°; next day 175,000 gallons were pumped, on this bed the snow was 15 in. deep, and the frost extended from 20 to 30 inches. The underdrain started in seven hours from commencement of pumping. On the 18th the frost was almost all gone, on the 19th it had nearly disappeared, while no traces of the sewage could be found. The temperatures of the air on the 16th, 17th and 18th were 6°, 20° and 4°. The analyses of the water from the under drains made by the State Board of Health have been entirely satisfactory.

At Atlantic City, N. J., it is stated there has been no trouble with frost at the beds, and at times in the winter the only open place in the creek is at the mouth of the effluent pipe.

In our own Province we have an example in the Provincial Asylum at London, which has been perfectly successful. This farm has formed the subject of numerous official reports. Its success is established and well known.

The farm at Berlin, Ont., has passed through one winter successfully, and we can point to several cases of isolated house drainage in use in this Province, the drains of which are laid from 12 to 15 inches under the surface and have worked satisfactorily for several years.

The writer has spent a great deal of time during the past ten years in measuring the force and taking the direction of the air in large sewers, and their temperatures both in summer and winter. He has made special observations on sewers in outlying districts, on which there were hardly any house connections; one in particular, a 15 inch pipe, has been observed for several years. It is half a mile long; there are four houses connected to it; it discharges into a large oval sewer which is about a mile long, and when first constructed had only one house connected to it. The observations in winter were taken when the thermometer ranged from 32° to—10° Fahr.; at—10° the lowest reading in the pipe sewer was 32°; no ice was ever observed in the pipe sewers; the observations were made by dropping a self-registering thermometer down the manhole as well as in the sewer itself. In the largest-sized sewer (6 ft. 6 in. dia.), with no house connections, and at the time of first observing no side sewers connected to it, one reading at 31° was taken when the air was 12° below zero, otherwise 32° was the lowest registered. Numerous readings were taken in this sewer, covering 6 winters, and after several side sewers had been connected, no reading was ever obtained under 32°.

This sewer, about a mile long, was opened at both ends for many years, being one of the trunk sewers; it carried a considerable quantity of surface water from a creek; no ice was found in it except for a few feet at the open mouth at the upper end. This experience leads the writer to believe that in a small pipe system, adapted to a system in which rain and elevator water is excluded, and only the sink, bath and closet water allowed to discharge, sufficient heat will be maintained in the sewer, when laid on streets having houses at the ordinary distances apart, to prevent freezing.

Each of us can readily name a number of towns where the presence of rock makes any attempt at sewerage prohibitive; some of us can possibly show that in consequence of requiring to lay the sewers at a depth to suit cellars the cost of construction has prevented the introduction of sewerage. The problem to be solved for these municipalities is, a cheap and efficient system of sewerage. This the writer believes can be effected by laying the sewers from three to four feet deep, and, if circumstances require it, protecting the pipes by a covering of some kind to make a frost-resisting space around them. A comparatively small flow of water will keep a sewer open and prevent it from freezing; from the writer's own observations he knows sewage will maintain a temperature above the freezing point during the coldest weather, even if flowing in small quantities; the more extensive observations by others, quoted in the early part of this paper, demonstrate the practicability of disposing of sewage during our winter season.

The conditions existing between the sewer pipe and the water-works pipe are different; the sewer will carry warmed water up to a late hour of the day, say ten o'clock at night; the temperature of the air in the pipe will be about 50°; the pipe will not be full; it will be laid on a grade or slope sufficient to cause a rapid discharge of the water; the pipe will consequently be practically empty. If proper precautions be taken to prevent cold air from rushing into the sewer, or striking down upon or into it, no fear need be entertained of the contents being frozen. To attain this, the best plan for ventilating the sewers will be by carrying out the overhead system.

In case of the water pipe it is always full, at certain hours of every day; towards midnight and early morning, the water becomes quiescent; there is no motion in it, the conditions for freezing are most favorable. The temperature of the water in winter is always close to freezing point and in a state to be readily acted upon by extreme cold, which does often so act upon it, with the result of freezing the pipes.

We can now affirm that a sewer pipe will not freeze, as the temperature of the sewage will always be sufficiently high to prevent it; we know that drain pipes laid under the surface, only fifteen inches deep, have worked satisfactorily for several seasons; we have experience in the methods of broad irrigation where large volumes have

been spread over frozen ground, and thawed it out ; we can observe at the mouths of sewers emptying into rivers, and the lake as in Toronto that the ice does not form close to the sewer, nor does it form in the sewers, even in those of the largest capacity in which the daily flow bears but a small proportion to the effective discharge of the sewer ; nor did it form in pipe sewers having a minimum quantity of sewage to which there appeared to be a considerable admixture of cold subsoil water.

To obtain efficient service from a system laid near the surface the writer advocates placing the sewer immediately in rear of the houses where house connection would be short, and the heat from the house water would be well maintained. A small pipe, even so small as six inches, laid at the back of each block, one for each street or two for the block if need be, would connect to a main sewer. These small sewers would take only the household waste water ; roof and cellar water would not be admitted to them. They would be laid in right lines beginning and terminating in manholes or chambers large enough to let a man enter for examination, and if the block was very long, another manhole would be placed at mid distance. These manholes need not be costly ; economy would have to be exercised in their construction. As to the cost of sewers so laid and their efficiency the writer will say that they will be cheaper, even if each side of the block requires a drain, than the present system. Under the orthodox system a house drain is about sixty feet long ; it is usually six inches in diameter. In addition to the cost of laying the drain under his house and connecting it to the sewer, the householder has to pay annual rates, or a specific sum for breaking up, repairing and maintaining the road surface against the constant openings which take place. Let him make up an estimate of what this costs him, as compared with the system now advocated, and he will find that a sewer in rear of his lot, with short direct connections from his house, will be much cheaper ; and in the question of health he will gain direct advantages which are incalculable.

The writer is firmly convinced that the proper place for sewer connections is at the rear of the property ; place them there with even a small pipe sewer with frequent places for examination and they will work satisfactorily and be infinitely more healthy than the existing arrangement.

These sewers would be connected at given points with the main sewers. By proper arrangement of these the length and cost of the main sewers would be reduced, and considerable savings effected in the cost of the system.

The writer desires to recommend for towns so situated –rocky in some parts, and clay, sand or gravel in other parts—a system of district sewerage, if proper means can be obtained for the disposal of the sewage. The writer was consulted about a year ago by a town in which the lower levels and business portion were situated on a rock foundation ; the rock came to the surface everywhere ; the higher levels,—the residential portion,—was built on clay, loam and light gravel. One residential portion was so situated that it could all be drained to one point at which there was an area of about an acre of good loam and light gravel. This portion could readily be drained and formed into a drainage district, the sewers would be small sized, the cost of them would not exceed the ordinary frontage rate, the preparation of the filtering surface and beds would not be excessive, and there is no doubt the working of the filter bed would be effective.

From the figures given in the early part of this paper, the filtering capacity of one acre of gravel appears to be ample for many small towns to commence upon. As the sewers are extended and house connections increase in number the filtering area can be extended. The State Board of Massachusetts has given some remarkable results from small areas, which look hopeful for the future of this form of sewage disposal. From these investigations it would appear that the English and European sewage farms are not being worked to a quarter of their full capacity. We will have to watch this method of sewage disposal intelligently to learn what is the maximum quantity of sewage a given area of filter bed will take without becoming clogged, and we have also to ascertain to what extent filtration through loam and gravel will prove effective against bacilli and spores of zymotic diseases and tannery and woollen-mill waste water ; as well as to learn how far it will destroy germs or spores of anthrax. Mr. Bowman, one of our members, town engineer of Berlin, informs me the filter beds at that place act satisfactorily on tannery waste as well as liquids from gas works.

There are numerous chemical substances which have proved efficient. Many of these may prove valuable and useful in solving a sewerage question where filtration cannot be effected. They should not be overlooked, as they have worked well in many places in Britain and Europe, and have been referred to and reported upon at different times by the Provincial Board of Health. One of the best of these seems to be the ferrozone and polarite system. Ferrozone, magnetic ferrous carbon, composed of 27 per cent. of ferrous sulphate, 19 per cent. magnetic oxide of iron, 11 per cent. of silicate, 24 per cent. of moisture and other ingredients in small quantities is soluble ; polarite containing 54 per cent. of magnetic oxide of iron with magnesia alumina, silica, etc., is insoluble. The Provincial Government is testing this system at some of its large institutions. The results will be carefully examined by many of us, and we hope we shall have in this material a satisfactory solution of the chemical treatment of sewage.

PUBLIC ABATTOIRS.

By J. Wallace, M.D., Alma Medical Health Officer.
Peel Township.

Mr. President and Gentlemen.—Mankind, ever since the devil first interfered with his domestic arrangements, is really an unclean animal. With him the odor of sanctity is too often the odor of dirt. Where men most do congregate there filth most abounds. He delights more in concealing it than abolishing it. Not till his pleasant vices become scorpions, or disease and pestilence strike terror into his selfish, slothful soul, does he wake up and resolve to be clean. It does not say much for this conceited nineteenth century that missionary societies, in the form of Boards of Health, should have to plead so zealously with it for the gospel of sanitation, or that Acts of Parliament with penal clauses should be necessary to enforce it.

The public abattoir is of ancient date, but, like in many a better thing, even Christianity itself, has not made that progress in the world that might have been expected. The term abattoir may be taken in its primary signification as meaning simply a slaughter-house, or in its more extended form of a cattle and meat market, where the slaughter house only forms a part. Ancient Rome, as far as the writer knows, was the first to establish public abattoirs, and during the reign of that notorious butcher of Christians—Nero—the abattoirs were magnificent structures. From the Romans the French introduced the system ; and strange, yet many may think naturally enough, that pre-eminent butcher of the human race, Napoleon I., was the first to abolish the individual slaughter-houses from the populous parts of the city of Paris, and establish the five still existing public abattoirs in the outskirts of the city. It is only within the last forty years that the great Smithfield market was abolished in the city of London, and that of Islington established. In this market, though there are some slaughter-houses connected with it, yet many of the cattle are allowed to be driven away and killed in private slaughter-houses in the most populous parts of the city. London is yet very far behind in having proper well regulated public abattoirs. The Edinburgh abattoir is most

complete, both in its construction and management. It occupies an area of 4½ acres. The booths are laid with thick, well dressed pavement, resting on a stratum of concrete twelve inches thick, and the walls to the height of seven feet are formed of solid asphalt. The roadways, too, are laid with concrete and causewayed with dressed whinstone pavement. The drainage consists entirely of glazed earthenware tubes. It is thoroughly ventilated. There is a bountiful supply of water, which by the aid of a steam engine is pumped up into a raised tank, and is used to flush booths, roadways and drains. The whole is under municipal control, and both animals and carcasses are carefully inspected, and all found unfit for human food are destroyed. Booths are rented and various fees exacted. The city disposes of the blood, manure, etc., and these realize a large amount of money. In many cities in Europe, and in the chief cities of the United States, public abattoirs have been established, but still much remains to be done, especially in Canada. It is only in the public abattoir that inspection can be thoroughly carried out, and not only the comfort and safety of the immediate community ensured, but also that of those living at a distance by the abatement of nuisance and the destruction of diseased meat.

In this paper I will only refer to two of the diseases which may be communicated to man by diseased cattle, the first being *tuberculosis*. A committee of the International Conference of State Boards of Health, held in Washington, gave it as their decided opinion that tuberculosis was a zymotic disease and that the germs are developed within the tissues of man by, amongst other causes mentioned, the flesh of tuberculous animals and from the milk of tuberculous cows. This is a serious matter, as it is a well known fact amongst breeders, that the highest bred cattle, from which our best beefing steers are produced, are very liable to this disease. In fact it is asserted by some that a large percentage are so affected. I have myself seen a fine thoroughbred fat beast, sleek and apparently without spot or blemish, which when killed was found to be so tuberculous as to be totally unfit for human food. Perhaps, in mild cases, when the meat is thoroughly cooked it may not be so dangerous, but many use it underdone, with the blood in it, as they say. Another dangerous mode of using tuberculous meat is when an apparently rich and tender raw piece of meat is scraped, as is recommended by

high authority, and the scrapings mixed with beef tea, "to strengthen it," and this administered to some weak loved one, under the impression he or she is getting the very elixir of life.

The second disease to which I shall refer is *actinomycosis*. Professor Cruickshank, pathologist to the Agricultural Department of Great Britain, says: "Actinomycosis so closely resembles tuberculosis in its histological character that it may be compared to a mimicry of tuberculosis." The disease is called "lump-jaw" in the country and is by no means uncommon. It is capable of being communicated from one animal to another and also to man. A remarkable case is given by Dr. Walmsley, late of Elmira, where a child he was attending had become affected from using the milk of a cow suffering from what he suspected to be actinomycosis. The doctor's suspicions were verified by the Analyst of our Provincial Board, Mr. J. J. McKenzie.

In every city and town, at least, a properly constructed, and properly inspected public abattoir should be established, within easy distance from cattle market, which should be convenient to railway, away from the populous parts, easily drained, thoroughly ventilated, a bountiful supply of water, proper disposal of offal, and thorough inspection of both animals and carcasses.

In the country some more effective means should be devised than yet prevails, as there is not the least doubt diseased animals are often slaughtered and sold to an unsuspecting public—it *may* be innocently?

And now, Mr. President, I must conclude this short, imperfect and hastily concocted paper, satisfied if I but open a discussion on a subject fraught with much that affects both ourselves and our fellow men.

CONSTITUTION

OF THE

ASSOCIATION OF

EXECUTIVE HEALTH OFFICERS

OF ONTARIO

AND INDEX TO THE

PROCEEDINGS OF THE ASSOCIATION

AT THE MEETINGS HELD AT

TORONTO IN 1886.	BROCKVILLE IN 1889.
WOODSTOCK IN 1887.	OWEN SOUND IN 1890.
TORONTO IN 1888.	TRENTON IN 1891.
LINDSAY IN 1888.	NIAGARA FALLS IN 1892.

GUELPH IN 1893.

COMPILED BY WILLIS CHIPMAN, C.E.,
PRESIDENT.

1892-93.

PREFACE.

The Association of Executive Health Officers of Ontario was organized on October 5th, 1886, at a meeting held in Shaftesbury Hall, Toronto, Ont. The official proceedings of this meeting are to be found on pages 69, 70 and 71 of the printed proceedings for 1887.

The papers presented at the annual meetings, and the discussions upon the same, are valuable to the medical health officer, the sanitary engineer, and all others engaged in sanitary work; but they lose much of their value without a full index.

No apology is necessary for the presentation of the following compiled index to the members of the Association, which index would be incomplete without giving the contents of each volume of proceedings, a list of the officers for each year, and the Constitution of the Association.

Copies of the proceedings of the Association can be obtained upon application to P. H. Bryce, M.D., Secretary, Toronto.

WILLIS CHIPMAN.

TORONTO, December 1st, 1893.

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CONSTITUTION

OF THE

ASSOCIATION OF EXECUTIVE HEALTH OFFICERS OF ONTARIO.

ORGANIZED - - - - - - *OCTOBER 6th, 1886.*
CONSTITUTION ADOPTED - *OCTOBER 6th, 1886.*

NAME.

1. This Association shall be called "The Association of Executive Health Officers of Ontario."

OBJECTS.

2. The objects of the Association shall be to promote the interests of the public health.

MEMBERS.

3. The Association shall consist of three classes of members: Ordinary, Associate, and Honorary Members.

ORDINARY MEMBERS.

4. Ordinary Members shall be persons who are engaged in executive health work, and may include the members and Secretary of the Provincial Board of Health, medical health officers, sanitary inspectors, and the chairman and secretary of local boards of health.

ASSOCIATE MEMBERS.

5. Associate Members shall include all ex-officers having held any of the above official positions; as, also, ordinary members of local boards of health, who will vote at ordinary meetings.

HONORARY MEMBERS.

6. Honorary Members shall include all ex-presidents of the Association, and such present members and other persons who, holding official positions elsewhere, may be elected by the Association.

Officers.

7. The officers of the Association shall consist of a president and two vice-presidents, a secretary-treasurer, and five members of council, all of whom shall be elected annually by a majority of ordinary members present.

Election of Members.

8. All persons desirous of being enrolled as members of the Association shall notify the Secretary at or before any regular meeting, stating at the same time their official status and the membership desired. The President and Secretary shall revise all such applications, and reserve for the consideration of the council any applications which they may deem necessary.

Payment of Fee.

In all cases where the application for membership is accepted the status of membership shall be granted on payment of the annual fee.

Amount of Annual Fee.

9. The annual fee for membership shall be one dollar for ordinary membership, and half-a-dollar for associate membership; and all fees must be paid annually in order to entitle members to vote.

Election of Officers and Council.

10. The officers of the Association and members of the council shall be elected annually, by ballot, at the first regular meeting of any year, the time of such meeting to be fixed by the President. Such meeting shall be called the annual meeting, and ordinary members alone shall be entitled to vote thereat.

Nominations.

11. Nominations to the various offices shall be made at the annual meeting, immediately prior to the order of business, for the election of officers.

Scrutineers.

12. At the annual election the presiding officer shall appoint two scrutineers, who shall receive the votes of the members, count them, and report to the presiding officer, who shall declare the result to the meeting.

Separate Ballots for Officers.

13. Separate ballots shall be taken for all the officers, but the councillors shall be voted for at a single ballot.

Casting Vote.

14. If in any case the votes are equal, the decision shall be by the chairman; or, in the case of councillors, by a new ballot.

Duties of President.

15. It shall be the duty of the President to carry into effect the regulations of the Association. He shall call the annual and other meetings, and shall regulate and keep in order all proceedings. In the absence of the President, the Vice-President will act in his stead ; and in the absence of both Vice-Presidents the members present may elect one of their number to the chair.

Constitution of Council.

16. The council shall be constituted of the officers and councillors elect, shall enter upon their duties the day following the annual meeting, and shall have power to appoint committees for special purposes.

Annual Report.

17. The council shall present a report to the Association at each annual meeting, in which shall be given an abstract of proceedings, and of receipts and expenditures during the year.

Filling of a Vacant Office.

18. In the event of any office becoming vacant before the annual meeting, the council shall have power to fill the vacancy.

Duties of Secretary-Treasurer.

19. The Secretary-Treasurer shall keep minutes of the proceedings of all meetings of the council and of the Association, shall conduct all necessary correspondence, and perform all the other general duties of a secretary. As Treasurer he shall keep an account of all the moneys of the Association, and shall be responsible to it therefor. All payments of money shall be made subject to the approval of the Association.

Branch Associations.

20. Local sanitary associations or other societies in the interests of the public health may become branches of this Association and take part in its deliberations. Members of branch associations in good standing, as certified by their respective secretaries, may vote at ordinary meetings of the Association ; but only members of the Association shall vote at the annual meeting.

Alterations of Constitution.

21. Notice of motion one week before the annual meeting shall be required, along with a two-thirds vote of all members present, for the change of any clause in the constitution.

OFFICERS OF THE ASSOCIATION.

OFFICERS ELECTED, OCTOBER 6th, 1886.

President—Dr. J. Sweetland, Ottawa.

First Vice-President—Dr. J. Coventry, Windsor.

Second Vice-President—Dr. P. P. Burrows, Lindsay.

Secretary-Treasurer—Dr. P. H. Bryce, Toronto.

Members of Council—Colonel Deacon, Lindsay; Dr. Rae, Oshawa; Dr. Robillard, Ottawa; Captain Clarke, Guelph; Dr. Cameron, Owen Sound.

OFFICERS ELECTED, MAY 18th, 1887.

President—Dr. J. Coventry, Windsor.

First Vice-President—Dr. P. P. Burrows, Lindsay.

Second Vice-President—Dr. E. Griffin, Brantford.

Secretary-Treasurer—Dr. P. H. Bryce, Toronto.

Members of Council—Dr. C. McLellan, Trenton; Dr. A. Cameron, Owen Sound; Dr. J. B. Lundy, Galt; Dr. H. P. Yeomans, Mount Forest; Capt. W. Clarke, Guelph.

OFFICERS ELECTED FEBRUARY 15th, 1888.

President—Dr. P. P. Burrows, Lindsay.

First Vice-President—Dr. E. Griffin, Brantford.

Second Vice-President—Dr. C. McLellan, Trenton.

Secretary-Treasurer—Dr. P. H. Bryce, Toronto.

Members of Council—Dr. Tracy, Belleville; Dr. Sweetland, Ottawa; Dr. Lundy, Preston; Dr. Cassidy, Toronto; Col. Deacon, Lindsay.

OFFICERS ELECTED AUGUST 21st, 1889.

President—E. Griffin, M.D., Brantford.

First Vice-President—J. D. Macdonald, M.D., Hamilton.

Second Vice-President—Willis Chipman, C.E., Brockville.

Members of Council—C. McLellan, M.D., Trenton; J. J. Cassidy, M.D., Toronto; H. Vaux, M.D., Brockville; H. P. Yeomans, M.D., Mount Forest; J. Coventry, M.D., Windsor.

OFFICERS ELECTED, AUGUST 21st, 1890.

President—Dr. J. D. Macdonald, Hamilton.
First Vice-President—Dr. C. McLellan, Trenton.
Second Vice-President—Willis Chipman, C.E., Toronto.
Secretary-Treasurer—Dr P. H. Bryce, Toronto.
Members of Council—T. Macfarlane, Ottawa; Dr. J. Coventry, Windsor; Dr. J. J. Cassidy, Toronto; Dr. A. Cameron, Owen Sound; Dr. T. V. Hutchinson, London.

OFFICERS ELECTED, AUGUST 20th, 1891.

President—Dr. C. McLellan, Trenton.
First Vice-President—Willis Chipman, C.E., Toronto.
Second Vice-President—Dr. F. Rae, Oshawa.
Secretary-Treasurer—Dr. P. H. Bryce, Toronto.
Members of Council—Dr. J. Coventry, Windsor; Dr. E. Griffin, Brantford; Dr. T. V. Hutchinson, London; A. McGill, B.A., Ottawa; Dr. Herald, Kingston.

OFFICERS ELECTED, AUGUST 18th, 1892.

President—Willis Chipman, C.E., Toronto.
First Vice-President—Francis Rae, M.D., Oshawa.
Second Vice-President—Allan Cameron, M.D., Owen Sound.
Members of Council—Hon. J. Ferguson, M.D., Niagara Falls; J. Coventry, M.D., Windsor; H. Howitt, M.D., Guelph; W. R. Hall, M.D., Chatham; A. McGill, M.A., Ottawa.

OFFICERS ELECTED, JUNE 28th, 1893.

President—A. Cameron, M.D., Owen Sound.
First Vice-President—Alan Macdougall, C.E., Toronto.
Second Vice-President—H. Howitt, M.D., Guelph.
Members of Council—W. R. Hall, M.D., Chatham; J. Coventry, M.D., Windsor; Chas. Sheard, M.D., Toronto; E. Griffin, M.D., Brantford; M. McCrimmon, M.D., Palermo.

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